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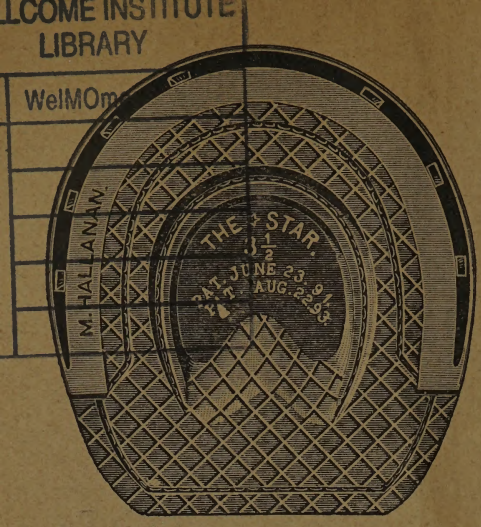

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THE
VETERINARY MAGAZINE.

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THE DIAGNOSIS OF GLANDERS.

BY LANGDON FROTHINGHAM, M. D. V.,
Assistant in Pathology, Harvard Veterinary School.

Of the infectious diseases confronting the veterinarian, regarding which it is of the utmost importance to the public welfare that a positive diagnosis should be quickly and absolutely made, there is perhaps none more trying than glanders. In numerous instances a diagnosis of this disease may be made *prima facie* from the physical signs, but there are other cases where the best veterinary skill is unwilling to condemn upon the symptoms presented. Such cases are not infrequently met with and are the greatest source of danger to the community at large, inasmuch as such animals are generally permitted to go upon the thoroughfares of our cities, and this presupposes infection of other animals. In any suspicious case, an absolute diagnosis, negative or affirmative, is of paramount importance, and naturally the more rapid such diagnosis, the more valuable.

The means at our command for diagnosticating glanders are, generally speaking, four in number:

1. *The Clinical Symptoms.*—It is not my purpose to dwell upon these, since they are sufficiently well known to every veterinarian.

2. *The Injection of Mallein.*—Although mallein appears today to be a much less trustworthy diagnostic agent than tuberculin, I feel that it is an aid to diagnosis not to be too lightly cast aside as worthless. Recent experiences would scarcely support this view, but I think the failures in these cases are to be looked upon as exceptions, and could fresh mallein from

the same source be used again, the results would be different. Foreign veterinarians claim much for mallein, and Foth (1) in a careful review of the subject, concludes that: Although mallein is not faultless, it is by far the best aid to the diagnosis of occult glanders, and that it has already been so adopted in practice that the practitioner can ill afford to dispense with it.

3. *The Cultivation of the Glanders Bacillus from Suspected Discharges.*—From the nasal discharge this is practically impossible. Positive results are obtained so rarely and then at the expense of so much labor that this means to an end is almost worthless. Moreover, it demands a scientific training not at the command of our average veterinarian. It is less difficult to cultivate the bacillus of glanders from cutaneous ulcers or suppurating farcy buds, but here also many attempts may have to be made before a positive result is reached, and again the average practitioner has not the requisite technique or the time and conveniences for such work.

4. *The Inoculation of Susceptible Animals.*—Of all the means at our command there is none to-day which can be so strongly advocated and so thoroughly relied upon as the inoculation of susceptible animals with suspicious discharges from suspected horses. A positive result signifies a diagnosis of glanders beyond the question of a doubt, while repeated negative inoculations must free an animal from suspicion.

The most susceptible animals to infection are horses, asses, cats, guinea-pigs, and field mice. On the other hand, cattle, swine, house-mice and white mice seem to possess natural immunity from glanders, while rabbits and dogs are but slightly susceptible.

The disease produced in susceptible animals by the inoculation of material containing glanders bacilli (for instance, the nasal discharge of a glandered horse) or of pure cultures of this bacillus, generally terminates fatally in from three to eight weeks. There is, however, one marked exception to this rule, namely, the field-mouse. In this animal infection becomes at once general, death occurs in from three to four days and numerous glanders bacilli are present in the blood. Thus field-mice can be used to great advantage in the diagnosis of glanders; suspected products from a suspicious horse are simply introduced beneath the skin, and if glanders bacilli are present, death results in three to four days. It should be borne in

mind that cultures of the glanders bacillus must be obtained from a mouse dying under such circumstances, for otherwise there is no proof that the animal did not die of a septicemia due to other organisms which well may be present in the material inoculated (nasal discharge, suppurating farcy-buds, etc.).

But field-mice are not always obtainable so that other susceptible animals must generally be used for such inoculations. Any of those above mentioned may be employed, but for obvious reasons the larger animals are not indicated.

Of the smaller animals, the guinea-pig is by far the best. Strauss (2) was the first to recommend the use of this animal in the diagnosis of glanders, and for special reasons. Although after the inoculation of pure cultures or of substances containing glanders bacilli, guinea-pigs do not as a rule, die for ten days to six weeks, Strauss demonstrated that typical lesions of glanders appeared in the testicle in from two to four days, and that from these lesions cultures of the glanders bacillus were easily obtainable. He therefore recommended these animals for use in the diagnosis of glanders, since thereby a positive diagnosis can be made in a few days.

His method is as follows: The nasal discharge from a suspected horse or pus from a suppurating farcy-bud is injected into the *abdominal cavity* of a *male* guinea-pig. In two to four days the scrotum becomes swollen, hot and painful; minute nodules are felt on the surface of the testes and these organs, one or both, are no longer movable within the scrotal sack. The epidermis may desquamate and suppuration may occur, the pus sometimes perforating the integument. The animal usually lives twelve to fifteen days, but if killed three to four days after inoculation, the two layers of the tunica vaginalis testis are found to be closely held together by more or less numerous granulations and suppurating centres. In these lesions the glanders bacillus is always present. Even as early as the second day, the tunica vaginalis is sometimes seen to be covered with granulations and often purulent centres.

If the inoculation be made subcutaneously, these symptoms also appear as a rule, but their appearance may be delayed for several days, so that it is better to make intraperitoneal injections, since rapid results are desired. It may also be mentioned here that occasionally no lesions whatever appear in the testes, which is especially true of subcutaneous inoculations,

although typical lesions are present in other organs, and that very rarely a guinea-pig will withstand an inoculation with glanders bacilli.

The method of Strauss has been confirmed by several investigators, among whom may be mentioned da Silveira (3) and Finkelstein (4). To further corroborate this method and to illustrate the great diagnostic value of such inoculations the following cases may be mentioned:

Case I.—Glanders had been suspected in this horse for several months. He had a suspicious discharge from the left nostril and the sub-maxillary lymphatic glands on the left side were slightly enlarged. The animal had been examined many times by several veterinarians, but none were willing to condemn by their physical examination and the horse continued at his work. When requested to visit this case, I found only the above symptoms; no ulcerations were visible upon the Schneiderian membrane. A little freshly discharged, thick, mucopurulent matter from the nostril was obtained on a sterilized spatula and placed in a sterilized test-tube. This was thoroughly mixed with several c.c. of boiled distilled water, and perhaps 2 c.c. of this mixture injected into the peritoneal cavity of a male guinea-pig. After two days both testicles were decidedly swollen, the skin over them red and hot, and painful to the touch. The testes were no longer movable in the scrotum and felt rough and minutely nodulated. The guinea-pig was killed and upon examination the testes showed the characteristic lesions of glanders previously described. Cultures upon potato and serum were made from these organs and two days later they showed numerous colonies of the glanders bacillus. (No autopsy was held upon this horse, as he was destroyed by the authorities before I was notified.)

Case II.—This animal was a vicious pony having a history of chronic catarrh for two years. There was only a slight discharge from the left nostril and no other evidence of glanders was present. A very slight amount of this discharge was collected on a small bit of sterilized absorbent cotton, which was held with forceps introduced into the nostril. This cotton was then soaked for a few moments in boiled distilled water, carefully pressed and about 2 c.c. of this mixture injected into the abdominal cavity of a male guinea-pig. Three days later the animal was found dead and autopsy

revealed the typical lesions of glanders in the testes, and numerous exceedingly small, almost microscopic glanders nodules in the liver and spleen. Pure cultures of glanders bacilli were obtained from all these organs.

The autopsy of this horse showed: Mediastinal glands enlarged and containing numerous glanders nodules. Both lungs contained many nodules old and recent. Liver: several nodules of long standing and some of later date. The nasal septum showed star-shaped cicatrices on both sides and some very small ulcerations. These lesions were too high up to be seen during life.

The following two cases were in the same stud as Case II, were evidently infected by that animal and are of unusual interest since the only lesions presented were in the cutis; in other words, these two are cases of *primary cutaneous glanders.*

Case III.—On the left cheek, slightly below and posterior to the angle of the lip was a circular ulcerative sore about the size of a fifty-cent piece. After removing the slightly adherent yellowish scab, the edges of the sore were seen to be rather irregular, the depth scarcely one-half a centimeter, the base somewhat rough. The discharge was serous in character and contained minute granules of a reddish-brown color (blood coloring matter?) thus giving a dirty brownish tint to the discharge. In the immediate neighborhood, but more posteriorly, were two other very similar ulcers though much smaller, and still more posteriorly a few minute elevations of the skin from which a slight serous discharge came forth upon pressure.

By scraping the base of this largest ulcer with a sterilized spatula, a small quantity of bloody serous material containing a few particles of tissue was obtained. This was mixed with boiled distilled water and with this fluid a guinea-pig was inoculated in the peritoneal cavity with the result that the typical lesions appeared after four days in the left testicle and cultures of the glanders bacillus were obtained from this organ.

About twelve days later an old, but healthy horse was inoculated from the largest cutaneous ulcer of the case under consideration. At this time the cutaneous lesions had almost entirely healed, and I doubted much if virulent glanders bacilli were still present. However, the base of the largest ulcer was firmly scraped with a sterilized scalpel and the cicatricial tissue,

blood and exude thus obtained were mixed with boiled distilled water and some 2 c.c. of this fluid injected subcutaneously in the neck of the healthy horse. Two guinea-pigs were also inoculated with some of the same material, one subcutaneously, the other in the peritoneal cavity. Neither of these pigs showed the slightest sign of glanders, so that I did not deem it necessary to visit the horse, which was under the charge of other veterinarians at some distance from the laboratory. This, however, was misjudged, for eighteen days later when I called to see the animal, I was informed that he had been destroyed the previous day, as he had almost succumbed to acute glanders and farcy. An autopsy was not then obtainable, but I was assured by the veterinarians in charge, that there could be no doubt as to the diagnosis and that there were ulcerations on the Schneiderian mucous membrane. Nothing definite could be learned regarding the local manifestations at the point of inoculation. (The guinea-pigs are still alive and seem perfectly healthy to-day—ten weeks after inoculation).

Case III was brought to autopsy two days after the above horse was inoculated, and the result was shortly as follows :

A chain of submaxillary lymphatic glands on the left side were enlarged, some very decidedly, and all contained glanders nodules. There were several minute nodules scattered irregularly throughout both lungs ; some just below the pleura, some deeper in the parenchyma. The mediastinal glands were not enlarged or in any way diseased.

Case IV.—In this case, again the lesions were cutaneous only, and here they were situated on the left buttock. The ulcers, perhaps six in number, varied in size from a silver dollar to a pinhead. They were all quite close together and between some of them was a subcutaneous communication. The edges of the larger ones were irregular and the basis rough ; in fact, they resembled those seen on the cheek in the preceding case. This animal had been seen previously by a physician and bacteriologist who had made cultures on glycerine agar from one of these ulcers. Of the various colonies that developed, two resembled greatly those of the glanders bacillus, and hence were transplanted to potato. The resulting cultures were in every way typical of the glanders bacillus, but to have still more proof a guinea-pig was inoculated subcutaneously from one of these cultures, and in five days was killed. The

autopsy showed besides an extensive suppurating cutaneous lesion at the seat of inoculation, typical pin-head granulations in the left testicle from which lesions pure cultures of the glanders bacillus were again obtained.

The autopsy of this horse showed that some of these ulcers extended to the underlying muscles, and that the inguinal glands were enlarged and contained numerous glanders foci.

I might add that the animals mentioned in Cases II, III, and IV, were injected with mallein, but only in one instance (Case II), did the temperature after injection rise above what it had previously been, and in this instance only 1° C., while the temperature of another horse in the same stable, which has never shown a symptom of glanders, rose 1.4° C.

These few cases are sufficient to demonstrate the immense importance that the inoculation of the guinea-pig is to the profession in the diagnosis of glanders. Such an aid cannot be too warmly endorsed. The pathological process in the testes is in itself sufficient to warrant an absolute diagnosis of glanders in nearly every instance, but it is always advisable to obtain pure cultures from such lesions. In fact, a very recent publication by Kutscher (5) makes this imperative, since in experiments of this nature, he has isolated from the nasal secretion of a glandered horse, a previously unknown bacillus, which, when inoculated in pure or impure cultures, causes similar lesions in the testes of the guinea-pig that the glanders bacillus does. Moreover, this bacillus is not morphologically distinguishable from that of glanders, and a differential diagnosis can only be made by cultivation upon potato. Upon this medium Kutscher's bacillus produces a white growth, instead of the well known brownish colonies typical of the glanders bacillus.

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ON THE VALUE OF THE COMPARATIVE METHOD IN THE STUDY OF PATHOLOGY.*

By Roswell Park, A. M., M. D.,
Of Buffalo, N. Y. Professor of Surgery in the University of Buffalo.

The most pleasant, if at the same time the most trying, of the numerous duties which your by-laws entail upon your President is the preparation of an annual address, in which he shall set forth before you the recent progress of our art or other matters of general professional interest which may prove, if not helpful, at least temporarily entertaining. As I have glanced over the annual addresses of my predecessors and have noted the wide range of subjects considered by them and have fully appreciated the value of their work and the eminence of their personalities, I have stood aghast at the task thus set for me. It may happen, however, to any earnest and faithful student of medical science who has made no brilliant discoveries of his own, and who has shown himself nothing more than a zealous traveler along pathways made for him by the feet of others, to view, as it were, regions into which as yet but few paths lead, or which have been untrodden as yet by the footfalls of his fellowmen. Into such regions he may yearn to explore, yet be without the necessary training or preparation. Yet, seeing these, he may sometimes do good by pointing out to others where their own explorations may be required and their time well spent. It must be in some such capacity, if at all, that I must serve you to-night.

I have, consequently, selected for the topic of my address a subject upon which I have at least reflected long and seriously, and have time and again yearned for light that either was not provided or was too obscurely hidden, and in such a way as to be concealed from easy appreciation. My plea, then, with you tonight is for a further extension of methods of comparative study in the investigation of disease and departure from the normal standard. Some such illustration, perhaps, as this may serve better to make known my meaning: There have been various methods devised of studying the languages, living and

* President's Annual Address before the Medical Society of the State of New York.

Nulla autem est alli pro certo noscendi via, nisi quam plurimus, et morborum, et dissectionum historias tum aliorum, tum proprias collectus habere, et inter se comparare.—Morgagni.

dead. An extreme in one direction has been to take the advanced grammar, and thus, beginning at the top of the linguistic ladder, gradually work down—a method by which even today too many young men waste their time over the study of Latin and Greek as well as of French and German. The other method, the so-called natural method, has been to begin with the simplest parts of speech, to deduce grammatic rules as the scholar advances, and to carry him along by easy and progressive stages until, at the culmination of his studies, parts of speech and rules for their use come as naturally as do the words which are to be marshaled together into grammatic form. The introduction of methods like this has robbed the study of languages for the children of to-day of most of the terrors which they presented for the children of my generation. The same comparative methods are evident in all the best educational institutions, and are being constantly improved by the best educators. The tendency toward the comparative study of the various branches of science is perhaps happily illustrated in the recent appearance of a text-book on comparative geology (by Keyser). This, perhaps, for the first time, does for geology what comparative study has accomplished for botany, zoology, etc. Most of the text-books on geology are confined to the geological phenomena of a single country, the rest of the world being dealt with in a very careless fashion. To be sure, this is in the main due to the fact that the writers worked within altogether too narrow limits and have little or no personal acquaintance with conditions in countries which to them are foreign. Nevertheless, the key to the great geological problems of our earth is not to be found in any one region, but must be comprehensively viewed and studied. If, now, these methods be important in linguistic study, in geology and in all the various branches where no one will deny their importance, how much more important are they for us in the study of the medical sciences! If we stop a moment to inquire why it is that this common-sense method of study, as all will allow it, has been so generally disregarded in the medical schools of the world, the answer will probably be found in the utilitarian view held by many that the time is not sufficient to permit of beginning at the bottom and working up, and that after all it is disease in the human race rather than disease in the lower orders with which we are especially to concern ourselves. Potent as is

this view in the minds of most, it nevertheless does not permit of full justice to the subject and should not be permitted to stand in view of the really higher interests of medicine.

While a man may be perfectly competent to reduce a fracture of a fibula and quickly put the patient upon his feet with a useful limb, who has never heard that the fibula is a disappearing relic, and that in many of the lower animals it is a larger bone; there, nevertheless, is no reason why, in the interests of higher medical education, this fact should not be perfectly familiar to him and to all. The man who removes an ovarian tumor successfully and conducts his patient through a speedy convalescence must certainly be considered a competent practitioner of his art, though he may have no comprehension of the peculiar findings within such a tumor, and may be as much at a loss to account for the teeth, the hair, the rudimentary mammary gland, or other structures which he may find there as the original possessor of the growth. Does it follow, however, that he can be considered a really educated man if he prove himself thus ignorant? The surgeon who exposes a dermoid tumor within the cavity of the cranium may have the technical skill by which to remove it and to secure a primary wound-healing and yet be utterly at a loss to account for its presence in that location. Is he to be content with his surgical skill, or are we to expect of him that he shall possess something more than this and be able to tell as much as anyone may know of the secret of such a growth?

I think you will all agree with me that such knowledge is most desirable, and that it really has a large degree of practical or utilitarian value. But how to get it and how to teach it is the great problem before us, and how to disseminate more widely the knowledge now possessed by a few is one of the tasks to which the wise men of the present have to set themselves.

First of all, we cannot for one moment afford to lose sight of the fact that our bodies are but aggregations of cells, each of which has its own individuality, even to some extent its own autonomy. Every organized being is then a republic of cells, but it is not yet widely enough appreciated that, as in a republic of citizens, a little disturbance in one region may bring about, by most unexpected agencies, a disturbance or even a revolution; so in the bodies, alike of plants and animals, cellular

disturbance at one point is sure to affect to greater or less extent the entire economy. In the higher animal and vegetable forms, however, the cellular organization is altogether too complex to permit of a study of the conditions which so disturb inter-relation of parts. If we are, then, to acquire any knowledge or idea as to what goes on within such wonderfully complex organisms as our own, we must begin with the study of those which are vastly simpler. In this connection I want to lay before you as a model, in my estimation, of what such study should mean, the *Researches on Inflammations*, by that indefatigable Russian biologist, Metschnikoff, who has for some years been so prominent a figure in the Pasteur Institute in Paris. If there be any one phenomenon concerning which we need more positive and exact notions than another, it seems to be this very one of inflammation. The changes attending it in complex organisms are so complicated and give rise to such wide diversity of disturbance, tissue-alterations and results, that we cannot afford to disregard one thing concerning it which may be gained from any source. Although this has been conceded for centuries, and although John Hunter appreciated the fact and, like many others, worked long and arduously at the solution of some of its attendant problems, it was Metschnikoff who, more than any other living man, in my estimation, has made the process clear simply because he began to study it in the lowest forms of living beings. To anyone who will read his fascinating work, the advantages of this method will be made so clearly apparent that he will wish that every pathological laboratory had its corps of Metschnikoffs in order to pursue work along the same general lines and by the same methods. But for our purposes and in various ways I would go even further than this. I would say that the beginning of all pathological and physiological processes should be studied in the vegetable kingdom first, where may be found the parallels of all those changes which go to constitute disease, even of complex type, in the human race. The elements of plant-physiology may be reasonably mastered within a comparatively short time without going too deeply into the principles of ontogeny and phylogeny; but if the circulation, for instance, is to be studied, it certainly can be best studied under conditions where it is most simple, and I would vastly prefer to see the student trained to know how the sap makes its way through the length

and breadth of a tree before he begins to think of how the blood circulates through his own frame. It is better that he should work up to a knowledge of the circulation if his medical education is to be complete, than work down to the simple after having begun with the complex. After he has mastered the normal circulation in plants, he will then be in a position the better to appreciate what takes place when a plant is wounded, and he will learn to distinguish between the true hemorrhage of vegetable organisms and a true exudation, and the differences between mere outpour of vegetable juices due to solution of continuity and the pathological secretions which take place when the parts have been irritated by parasites, exposure to injuries by vicissitudes of weather, or have had the character of their secretions materially, sometimes almost totally, altered by variation of surroundings, changes in soil, etc.

How much better, then, to begin studying the activities of cells in the lowest and most immature organisms first. If the study be begun in this way it will be seen that the formative activity of cells dominates over their secretive activity, and it will be found, for instance, that those cells which have passed out of the gland as waste products may remain and proliferate more or less independently. This, by the way, may be a factor in explaining the genesis of cancer; *e. g.*, in the breast. It will be seen, too, that the behavior of cells, as well often as of organs (composed of them), depends in large degree upon the quantity and quality of nutritive material which is at disposal. Thus, among the bees, it depends upon the nutrition supplied to the female larva whether it shall remain a neuter or become a sexually perfect female.

There is one law, however, of cellular physiology which is apparently never violated, and that is, that a derivative of one germ-layer never by any chance develops a structure originally derived from another. Consequently after differentiation of the blastodermic membranes no wholly indefinite cells are formed. Those cells which are thereafter formed can develop only certain tissues. But all these cells are directed by some unseen force, even when they appear uncontrolled, and in a suitable environment will always tend to arrange themselves into the form of the organism from which they originated. Thus, a small detached bit of hydra soon moulds itself into the complete shape of the parent organism. The property of selective

assimilation seems to be possessed by cells in common, and those of a given part appear to have the power of moulding adjacent material into cells after their own kind. This is shown by the fact that a tail is reproduced when there was a tail, and a leg, and only a leg, where there was a leg. These processes have been likened to those by which a crystal reproduces its lost apex when placed in a solution of identical material. The lower the animal or vegetable form the more complete is the power to reproduce the lost parts; the higher we ascend the scale the more limited does this become, until in man the ability to reproduce lost parts is almost completely gone, and when noted at all is seen only during the beginnings of life or its early stages, at a time when there is still more or less embryonic tissue which can functionate. Thus, during the early periods of embryonic life, there may be more or less complete reproduction of fingers after injury, though nothing of the kind occurs in adults. There are cases on record of reproduction of supernumerary digits after amputation, which seems the more remarkable because the normal digits have no such power of regrowth, the nearest approach being the occasional appearance of imperfect nails on finger stumps after amputation. Simpson several times noted that arms amputated *in utero* by bands grew again to a certain extent, while in one case the extremity was divided into three minute nodules, on two of which small points of nails could be detected. This is probably as far as attempts of this kind have ever been observed in our own species. In the same way in plants, adventitious buds, like adventitious fingers in the fetus, differ from the normal only in respect to position. Such buds originate in the same way and have been found upon almost every part of plants. They sometimes develop in extraordinary numbers upon the stem and branches of trees owing to some interference with the vegetation of the normal buds. More easy adaptation of part to circumstance is, however, seen in the vegetable than in the animal kingdom. Du Hamel planted a willow with its branches in the ground and its roots in the air and saw the roots become covered with buds, while the budding branches produced roots. Adventitious buds may also be found on the petiole, lamina and other parts of the leaf. Thus the bud, like the ovum, is to be regarded as an individual vital centre. Parthenogenesis, which never occurs in the animal kingdom, may

be frequently seen in the vegetable, and buds apparently may arise where undifferentiated cells are present.

In either kingdom, however, as soon as cells begin to specialize, they lose the primary general function or power of reproducing the entire organism, apparently because all of the original protoplasm has been specialized and used up. In the higher organisms certain cells never attain high development, but remain always in a lowly organized condition and serve either as germs for reproducing the entire individual or for forming and maintaining various tissues and organs, remaining, as it were, in reserve. Such cells are found in all growing organs and tissues, and, according to Williams, are the only real cancer- or tumor-germs. Most of the specialized cells of an organism produce only those which are incapable of acting as germs for an entire individual; *e. g.*, epithelium always produces epithelium.

Since much of what I have to say to-night pertains to the genesis of tumors, it may be worth while to reiterate Williams' views to the effect that every phenomenon of neoplastic growth has its counterpart in the normal processes of evolution, and that the better we understand the latter the better we shall appreciate the former. On the one hand, there is continuous perfecting of bodily structure by differentiation; on the other, continuous transition from lower to higher types of development. Each individual reproduces in its own life the most important morphological changes through which its long line of ancestors has passed. In every act of reproduction a minute quantity of protoplasm is transferred from the producing to the produced offspring, and along with it the molecular condition peculiar to the parents; and upon this heredity depends. The persistence of impressions, or what has been called unconscious memory in protoplasm, is the property upon which, in ultimate analysis, the phenomena of heredity will be found to depend. Organisms which have undergone impressions under new conditions tend to return to the original structure or habits when restored to original surroundings. When we seek for the influence most potent to produce variation in protoplasm we must agree with Darwin, who says: "Of all the causes which induce variability, excess of food, whether or not changed in nature, is probably the most powerful." Viewed in this light, the sudden development of a neoplasm in an otherwise healthy

organism is the outcome of gradual and continuous changes in the evolution of the cells of the affected part, owing to minute and as yet unrecognizable changes in the nutrition of the cells. Regard for a moment the effect of too much or too little nourishment. Young trees, for instance, often remain sterile because of too rich soil and too much excess of fluids; while too warm a temperature hastens the second sprouting, the necessary juices are kept away from the first and fruit blossoms may be prevented from developing. Among the little insects known as plant-lice, agamic multiplication continues throughout the summer if only external conditions—*i. e.*, weather and supply of nutrition—are favorable; but when the weather becomes cold, and the supply of sap in the plant fails, fertilization of ova is again necessary.

But study vegetable pathology for a few moments, regarding plants as if they were animals and likening the sap to the circulating blood. Carrying out this analogy, the vegetable pathologists describe what they call ischemia and even necrosis in plants, and show how these may occur from injury to the roots, from interference with circulation caused by grafting, from abusing the tree, from early frost, improper soil, etc. They show also the alteration in natural fluids in the presence of disease; and it is of some interest to know that the secretions of parts involved in necrotic, or so-called cancerous changes, contain gallic and humic acids. Furthermore, studying the effect of alterations in light and air, they describe conditions of plant life analogous to chlorosis and icterus, alleging perverted nutrition, usually in the direction of too much and too rich food with too abundant moisture as the causes of these conditions. They also describe what they call dry gangrene, while in the presence of stasis with decomposition of the fluids which should be circulating there is sufficient irritation with perversion of nutrition to influence cell-growth into the development of so-called cancer in trees.

In my estimation there is as much hope of getting light upon the vexed question of origin of tumors by the study of influences operating to produce them in plants and trees as from any other source. The influence of certain fungi in producing sclerotic changes in vegetable tissues is also very much in accord with what we know to result in animal tissues from the presence of parasites. There is, for instance, the peculiar

fungus known as the peziza, which produces most extensive sclerotic changes, both internally and near the surface. The great beauty of studying disease in vegetable life is the abundance of material and the absence of sentiment concerning its utilization. A great deal of vegetable pathology is yet to be learned by the inoculation method, since there is just as much possibility of deliberately infecting trees by artificial inoculation with various parasites, to them pathogenic, as there is in our pathological laboratories of infecting animals.

And here, by the way, the expert agriculturist or the student of scientific agriculture, horticulture, etc., in our agricultural colleges is a person whom the veterinarian and the human pathologist would do well to cultivate, since to such an one are known many facts to him of great practical importance, which yet have a significance reaching far beyond his environment and embodying general principles with which we ought to be equally familiar, although, sad to say, we seldom are. I often consider it a great pity that there are not societies where men in these various walks of life may get together and disseminate more widely a knowledge which physicians as such rarely, if ever, possess, but which could be by such communications made of great value.

For example, the reaction of vegetable tissue after wounds is even to physicians most instructive. If after bruising of a plant, for instance, the bruised portion be left *in situ* it decomposes easily, while the wound itself heals with difficulty or even not at all, and necrosis of surrounding tissue often follows. Is not this the exact counterpart of what one might say of wounds of the animal body? It is of passing interest even to remember that hailstones may produce injuries, contusions, etc., which shall materially affect the nutrition of a plant or tree, and that contused wounds made in this way may be followed by more or less disastrous results. There is also a difference between what we may call the bleeding of a tree and pathological secretion after certain injuries. The latter originates in and near the injured part; the chemical nature of the secretion is altered, and a variety of materials, to us most useful, are in this way produced, although the causes have in but rare instances been studied out. For example, the various resinous materials, and such substances as tragacanth, manna, and other gums, are all pathological secretions produced in consequence of more or less

specific irritations. Then, again, open wounds in trees give peculiar opportunity for microbic infection or that by other parasitic fungi, which, as a rule, causes necrosis of the plant- or wood-tissue. Such infections, however, in trees rarely spread widely, and the resulting necrosis is for the most part local. Only those products of decomposition which are soluble are diffused into surrounding tissues, where their influence may be injurious. Hemorrhage, so called, in plants is the result of a fresh wound, the peculiar juices, sap, etc., exuding, possibly to an extent so serious as to lead to the death of the plant. The most damaging exudate, however, is that of gum from trees after their foliage is out; the reason for which is that the exudate exerts such pressure that there is stasis and even coagulation of fluids between the cortex and the woody part of the tree, by which circulation is impeded. Again, it often happens, as the result of frostbite during foliage, that the cortex (bark) may rupture and permit escape of this coagulated secretion from the disturbed part. All of which only makes things worse, since there is now thrown out a still more irritating secretion (often spoken of by agriculturists as chilblains), which not seldom forms an open cancer upon the tree. In a minor way, pathological flow of gum is also produced by the stings of beetles, and of many other insects which lay their eggs in the cortex, the lesion then being strikingly analogous to that produced beneath an animal's skin by the sting of certain insects, etc.

Yet different is the peculiar yellowish, sticky, sweetish-tasting substance, of unpleasant odor, often seen upon the upper surface of the leaves and stems of many plants, where it may gather within a few hours. This is commonly spoken of as "honeydew" (*melligo*). It is an abnormal secretion of certain plants whose juices are rich in sugar. It is most commonly found in the spring after sudden changes of temperature, escaping from the cells, through the pores, upon the surface of the plant, where, combining with the moisture of the atmosphere, especially during the cool of the night, it is precipitated upon the surface, thus closing the pores from which it has escaped and interfering with their function as well as with the growth of the plant. This may be washed off during a severe rain; but if not removed by natural processes, is liable to ferment, it being quickly attacked by minute fungi. The

benefit to infected trees and plants of severe rain and wind, which are thus destructive agents of these fungi and permit the re-establishment of normal vegetable function, is then most easily appreciated.

In plants and animals alike, the process of repair and the neoplastic tendency are closely allied, differing only in degree. The new growth of repair serves to replace that which has been lost; while that of neoplasms is indefinite and knows no bounds, the subordination of local processes to tissue-necessities and to specific hereditary tendencies having been lost.

The *formation of tumors in trees* seems to me a subject of very great interest. All the woody tumors have been grouped in a general way under the term "xylomata," while among some of the botanists they are indiscriminately called cancer. In the majority of cases the so-called cancers of plants occur around the sites of previous injury, where the natural process of healing has been interfered with and where the cambium produces an abnormal amount of parenchyma instead of healthy wood. Lesions of vegetable tissue produced by frostbites are particularly liable to be followed by these xylomatous formations. They may also be produced by the stings of many of the small parasitic animals, like plant-lice. The pyrenomycetes are known to be the cause of some of the xylomata. In the populus tremulus, for example, the stems and branches often show tumors of varying, even of large size, the hypertrophy commencing in the cortex, involving all or only part of a limb, being followed by swelling of the wood proper and later perhaps by destruction of the cortex by frostbite, with exposure of the wood beneath, necrosis ensuing. The importance of the lesions produced by exposure to cold is not generally realized. It is, moreover, of peculiar interest that trees inoculated with cancerous sprouts or grafts become themselves cancerous (Lucas). Lorauer has described two forms of so-called cancer in the apple-tree, both of which seem to result from frostbite—one a rose-like growth with a necrotic centre surrounded by terrace-like edges, enlarging yearly; the other, a closed form of growth appearing upon branches, attaining a size three or four times that of the plant, with a funnel-like depression, the edges of the original lesion rolling in toward each other instead of diverging as in the previous case. Physicians are made familiar with a very limited number of these xylomata when

they study the materia medica of the astringents and are told about the origin of gallic acid. The student is informed that the nutgall is the result of irritation produced by an insect, and that perhaps at least one hundred species of gall are known upon the oak; but here his acquaintance with the xylomata ceases, and he is taught no far-reaching lesson from this fact in vegetable pathology.

Perhaps the most instructive animal-parasites of trees and plants to watch and study are the so-called plant-lice, since they pass their whole lives upon plants and draw from them their nourishment. These little insects fasten upon the plant by suction, puncturing the part and producing an irritative action which is followed by a variety of lesions, from hypertrophy of irritated tissue to speedy necrosis. The hypertrophies may have the character of true galls. One form of plant-mildew indeed is produced by these same little animals, being in effect the empty sloughs which they leave behind and which remain as a white mass upon the green surface. These same plant-lice are the active agents in the production of certain tumors often spoken of as cancer. But it is especially the so-called blood-lice, which live in young plants and thrive best in fresh wounds, that lead to most marked neoplasms. The blood-louse is an almost motionless parasite, which attacks young plants upon wound-edges where it finds the tissues thin enough to have ready access to the plant-juices. When this parasite has fastened, the cambium becomes more active and hypertrophied, while the plant-cells, being now exposed, absorb moisture and swell even to the point of bursting. By this means long, elliptical clefts are formed, and these often become the site of so-called cancers. It will thus be seen that nearly all, if not all, of the so-called xylomata are really of parasitic origin. It will not do, however, to argue too loosely from this fact that the same thing is true in the animal-world. We at least have not yet sufficient evidence to make so positive a statement.

The xylomata have been divided by Williams into three main groups:

A. Discontinuous or circumscribed growths, to which the vague name of "knaurs" should be restricted. This includes nodules so often met in the bark of common trees. These are usually rounded swellings in the deeper part of the bark, varying

in size from a pin-head to a cocoanut, usually encapsulated, often with fibro-vascular pedicles connecting broader portions with the woody tissues of the trunk or stem. These on section consist of dense wood showing all the structural elements of the tissue from which they spring, only atypically arranged. Most of these tumors arise from disorderly growth of adventitious or dormant buds which may remain in quiescent state for years and then develop renewed activity. These tumors may even be utilized for purposes of propagation, as in the case of buds of some species of apples, which produce both roots and leaves in abundance.

B. Continuous tumors, corresponding to exostoses in animals, presenting as woody outgrowths of the trunk or plant. They may attain great size, weighing fifty pounds or more. They seem to arise by excessive local cell-proliferation of the cambium.

C. Totally new growths, presenting a surface thickly studded with shoots and stunted branches. This is a combination, in fact, of exostosis with diffuse bud-formation—that is, of the preceding forms.

For the cellular pathologist, then, a tumor in an animal or upon a tree is practically the same, it making no difference even whether it occur upon the bark, upon the leaf, or anywhere, provided only that a previous pathological lesion has occurred. The nut-gall which arises in consequence of the puncture of an insect, the tuberous swellings which mark the spots on trees where boughs have been cut off, and the wall-like elevation which forms around the border of the wounded surface produced by cutting down a tree and which ultimately covers in that surface, all of these depend upon proliferation of cells just as abundant, just as rapid, as that which we perceive in the growing tumor in the human body. The process in plants conforms practically to that in animals, both being of the same general type.

Malignancy of tumor-formation is largely a process of cell-degeneration and incompetence. When in animals it begins in mesoblastic connective tissue, the more imperfect the cell-development the more of the round-celled type it assumes in consequence. Hence the malignancy of sarcoma is to be judged of quite accurately by the roundness and incompleteness of its component cells. In benign tumors the reproduction of cells

is more orderly, but is not in harmony with the demands of the rest of the system. The simplest of all the body-tissues is its fatty tissue, and fatty tumors are the most frequent of all benign growths; while true gland-tissue, which is most difficult to irritate, furnishes the smallest number. True cancer has been described most attractively as a "parody upon the gland tissue;" and it certainly is a hideous travesty of its kind. It occurs most often in tissue which has outlived its usefulness, like the mamma, the uterus, etc.; and it is in such tissue, for the most part, that true carcinoma, or the so-called "rebellion of the cells," occurs (Hutchinson), while epitheliomata occur also in worn-out tissue, usually under the stimulus of some irritation. Epitheliomata are rare among the lower animals as compared with man, and, when met with at all, occur most often in the domesticated animals and those in confinement. Sarcomata are common in all classes of animals, from the fish upward; but even these are more common among those ordinarily domesticated. (Possibly this is only an apparent prevalence rather than a real, because of much greater familiarity with animals in domestication.) Carnivorous animals are more prone to malignant disease than are the herbivorous, while the reverse is true with regard to liability to tuberculosis. Cartilaginous tumors, particularly in the breast, are much more common in animals than in man. The quadrumana, however, manifest but little disposition either to neoplasms or to tuberculosis.

In cancer, atavism, or reversion to an earlier type, may be traced back to the hydroid stage, where simple fission is the prevailing method of multiplication, in consequence of which we have a longer-lived and more aggressive cell-growth, which we call malignant. If a mesoblastic cell be the ringleader instead of an epiblastic, we then have sarcoma with its less brilliant but more stable cellular achievements (Hutchinson).

These neoplasms are not peculiar, as will be seen and as has been seen, to man, nor even to animals, although it must be stated that epithelial neoplasms are of rare occurrence in the lower animals as compared with mankind, and that they are apparently more common among the domesticated than among wild animals. On the other hand, sarcomata have been met with in nearly all classes of animals, from fish upward, although these also occur most often among the domesticated. Dogs,

horses, asses and pigs are particularly liable to sarcoma of the testicle. Horses, especially those of light color, are most prone to melanotic sarcoma of the anal region. Horses are also quite often victims of psammoma in the brain. According to Rayer, carnivorous animals are more prone to malignant disease than herbivorous. The benign tumors, like fibroma, enchondroma, and osteoma, are almost as widely diffused as sarcoma. Fatty tumors are frequently seen in domesticated animals. Mammary fibro-adenoma among dogs and cats is fairly common, and chondroma of the mammary gland is much more frequent among animals than among men. Cystic ovaries are also common in the domestic animals.

Among the most remarkable phenomena pertaining to cells is the peculiar tendency to reappearance of traits and qualities peculiar to remote ancestors and quite out of keeping with cells in their present locations. Sutton divides these into *vestigia*, or those affecting whole organs or races, and *degenerations*, or those affecting general groups of tissues. It is the partial reappearance of traits and qualities peculiar to some remote ancestor which we speak of as vestigia. Among these most prominent, for example, are the congenital malformations of the ear and the appearance of rudimentary or additional auricles. In fact the whole arrangement of the external ear shows atavism toward the type of the carnivoria and herbivora, the rudimentary and now useless muscles pointing clearly to the movable ear of those orders. But the human ear points further back than this, and by its development from the remains of the first branchial cleft points distinctly to fish ancestors and gill covers, the auricle being the relic of the operculum. Other relics of the opercula appear in the appendages so well described by Sutton as cervical auricles—*i. e.*, the little tags which make their appearance along the anterior border of the sterno-mastoid. That these are not mere freaks is shown by the fragments of cartilage, muscle-fibres, etc., which they contain. These appendages may be cystic or open, forming diverticula to such an extent that fistulous passages may extend clear through to the pharynx, forming the so-called branchial fistulæ.

But it is rather to another aspect of the embryology of the head and neck, especially in its ontogenetic and surgical relations, that I would like for a few moments to invite your attention. Sutton

has shown (*Journ. of Anat. and Phys.*, vol. xviii., p. 28, "A Critical Study of Cranial Morphology,") that the bony framework of the skull, morphologically considered, is a mere addition to the original primary cranium, which is in reality represented by the dura. Very early in embryonic life the dura and the skin are in contact, while the basal and lateral portions of the cranium gradually chondrify, thus separating these two structures. We too often forget that the skin and dura are in contact along the various sutures, often for a year after birth, and that this close relation persists longest in the region of the fontanelles and the torcular. The practical bearing of this is that the formation of an intracranial dermoid, by inclusion within the rapidly growing cranium of a few dermal or epiblastic elements, is not difficult to understand. The pedicle of such a cyst or tumor may easily become surrounded by the rapidly-forming new bone, in which case the cyst may be entirely covered, or may be with or without some trifling fibrous connection with the overlying scalp.

But of much more importance than this is the original communication between the primary alimentary canal and the central neural canal. Additional facts proving both the anterior and posterior communication of these original canals have only been recently brought to light and are of sufficient importance to justify some description in this connection. Some fifteen years ago Owen attempted, unsatisfactorily, to show that the gullet of ancestral vertebrates was continuous with the third ventricle, and that the space from the pineal to the pituitary bodies by way of the infundibulum represented this primary gullet. He had, however, been preceded by Dohrn, who thought that the fourth ventricle marked the place where the œsophagus pierces the nervous ring. It has remained, however, for Gaskell and Sutton to show that the tube which now represents the central nervous system in the invertebrates is really the disused segment of the former primary canal. These two scholars, working independently, have arrived at fundamentally the same results. They have profited by Hertwig's investigations, who has shown that the original pleuro-peritoneal cavity is a derivative of the fundamental alimentary canal, arising as two separate diverticula whose central portions persist as the permanent alimentary canal, while the lateral portions coalesce to form a common pleuro-peritoneal chamber.

This fact is of no small importance, both from the embryological and the pathological standpoints, since it shows how the cells lining the peritoneum are really of hypoblastic origin, and that the pleuro-peritoneal cavity is represented in the invertebrates in the so-called gastrula-stage of inversion of the exterior surface.

In the very young embryo we find a fundamental U-shaped tube, from whose anterior branch is developed the alimentary canal, and from whose posterior branch, representing the notochord with its central neural canal, are formed the brain and spinal cord. This tube is lined by a continuous layer of columnar epithelium, and terminates at the cephalic end by a cul-de-sac. The anterior branch is widely open to the yolk-sac, and this becomes connected with the exterior by an epiblastic involution which opens up the cephalic end of the now primary gut; while at the same time a diverticulum, the so-called pouch of Rathke, makes its way in the direction of the cephalic end of the other branch of the original tube, uniting with it, in fact, by an analogous diverticulum produced from the other side, to which I shall recur in a minute. Again, at the caudal extremity there is another involution of the surface, where an opening is established. All that remains of the anterior branch of the primary U-shaped tube between this division and the posterior branch, known as the post-anal gut, is represented in the adult by Luschka's or the coccygeal gland. Occupying the flexure of the tubes is a chain of sympathetic ganglia with branches to each section. The anterior branches ramify in the walls of the bowel and develop intrinsic ganglia and plexuses, with which the names of Auerbach and Meissner are closely associated; while those going to the posterior disappear in its substance, join with groups of nerve-cells developed in the thickness of its walls, and form the gray matter of the spinal cord. In this way certain nerves persist and bring these two systems into close relationship; these are known as the splanchnic. Thus it will be seen that in the dorsal section development is in the direction of nerve-cells, while in the ventral section development is rather into muscle-cells, the two being associated by the splanchnic nerves. The epithelium lining the posterior tube fails to develop; that lining the anterior becomes highly specialized for digestive purposes. Although it may disillusionize some of us, it is, nevertheless,

to be stoutly maintained that the canal of the central nervous system is really of intestinal origin, as shown by their original continuity, their similarity in fashion of development, their correspondence in point of time, their close inter-relation through the splanchnic nerves, and by the association of numerous malformations of the central canal of the cord with deformities of the alimentary canal.

What, now, is to be said of the anterior communication of these canals? If one will take the trouble to dissect carefully the macerated sphenoid bone of a six or seven months' fetus (or younger), he will find it to contain much fibrous tissue, in the midst of which he will detect a small canal that may be entered, sometimes even in the fœtus at birth, by a small probe introduced in a minute recess of the mucous membrane exactly in the middle line of the nasopharynx, close up to the base of the skull. This pocket, often half an inch deep, is known as the bursa pharyngea, and may often be seen in the adult. It marks the pharyngeal termination of what is known as the cranio-pharyngeal canal. It would be noticed much oftener were it not surrounded by a collar of lymphoid tissue, known as the pharyngeal tonsil, corresponding to the collections of lymphoid tissue which mark the site of other obsolete canals. The internal opening of this canal is to be found in the floor of the sella turcica. This is the remains of the diverticulum already alluded to, which has made its way from the cavity produced by the infolding of the integument at the cephalic end of the anterior branch of the original U-shaped tube.

The remains of the other diverticulum, extending anteriorly from the upper end of the posterior branch, are to be seen in the fourth and third ventricles and their communication with the infundibulum. Here, again, the relation of the pituitary body and the so-called pineal gland to this anterior neurenteric communication is most interesting and most important. The structure of the pituitary body is so often likened to that of the thyroid, the thymus, the adrenals, etc., which are all of obscure origin, that anything shedding light in this direction is of great interest. According to this view we must, then, regard the pituitary body as the intracranial lymphoid tissue, which again marks the site of this obsolete canal. I think the investigations of Beard, Gaskell, and Sutton may now be regarded as clearly establishing this fact. Wiedersheim also

regards what he calls the pineo-pituitary tract as the primitive mouth-part, archeostoma, or gullet of the ancestors of the vertebrates, the present mouth (*neostoma*) being an ingrowth, as indicated, between two branchial arches. If in this way the pituitary body can be shown to have, embryologically at least, a more intimate relation with the alimentary system, it may help to shed light where it is much needed—upon the obscure etiology of such a disease as acromegaly.

This brings up also the proper position of the pineal gland, so-called. Within a few years we have been taught that this is the remains of the pineal eye, or that it is to be classed as an original and perhaps rudimentary sense-organ. But later researches have failed to confirm this theory, since it has nowhere been found functional. I may quote a statement from Professor Woods Hutchinson, nephew of Jonathan Hutchinson, who states in a letter to me:

"I have carefully compared all the plates and representations of this organ and its sections which I could procure, with the result of a decided conviction that all that can be said of this body is that it was an epithelium-lined cavity at some time, communicating both with the surface and the ventricular cavity of the brain; and it has as much the appearance of having been mouth and gullet as eye-bulb and optic nerve. I have also consulted several morphologists upon the question, and they tell me that all one can definitely say is that it is the degenerated remains of an epithelial (cerebral) outgrowth of some description."

(See also editorial by him in the *Medical News*, June 6, 1895: "Is the Brain an Appendage of the Alimentary Canal?")

If this view be accepted, a large class of hitherto mysterious processes and lesions is more susceptible of explanation than by any other theory yet devised.

[To be continued.]

For Warts.—Apply daily a mixture of flowers of sulphur (150), glycerin (375), and pure acetic acid (75). Gradually the warts become shriveled and dry, and finally drop off. Shake the mixture well before it is used.—*Lyon Médical.*

VETERINARY MEDICINES.

THEIR NATURE, PROPERTIES AND DOSES.

By Hon. Thomas J. Edge,
Secretary, Department of Agriculture, Harrisburg, Pa.

During eighteen years of practical experience with the diseases of animals, as special agent of the Governor, under the act of May 1, 1879, and as secretary of the Board, under act of May 9, 1888, and under previous acts, the writer has often felt the want of a condensed compilation showing the nature, properties and doses of the more common veterinary medicines, and of having them collected into a form of admitting of easy reference. Under the present system adopted by veterinary writers the different remedies, their properties and doses, are usually scattered throughout the whole volume, and, especially with practical farmers, great difficulty is experienced in adapting them to such portions of veterinary practice as are usually forced upon the owners of live stock who are distant from veterinary surgeons, and who, even after the veterinarian has been sent for, are anxious to do something which may, if possible, decrease the difficulties of his task when he reaches the sick animal.

With this purpose in view, the following compilation has been made, and for it the writer claims no new or recent discoveries, but he has simply attempted to put the matter into such shape as will make it available to those into whose hands the reports of the Board of Agriculture may go. It has been his desire to avoid the use of scientific terms and of language not readily understood by the practical farmer, but, in many cases, the use of a somewhat uncommon term will materially shorten and simplify the meaning ; in such cases, words used by medical writers have been used, and the following list of them and their signification has been prepared with the hope that it may explain anything of a scientific character which may appear in the subsequent article.

Only the more prominent and most commonly used words have been selected, and numerous sub-divisions have not been noted ; in many cases, for the precision required by veterinary

science, some of the classes have been sub-divided into three or more classes, so that the exact meaning of each may be more closely determined ; these are seldom, if ever, used in the practical part of veterinary practice which falls to the lot of the farmer, and we, therefore, have given them no attention. There are, also, numerous synonymous terms used, which are, for a like reason, not placed in the list.

In treating of the nature and properties of veterinary medicines the following terms are repeatedly used, and when thus used are intended to convey the meanings attached to them in the following list :

Definition of Terms.

Antiperiodics.—Medicines given in cases in which the outbreaks or manifestations of the disease occur at regular periods ; their intended effect is to prevent the recurrence of the outbreak at its regular period, and thus cure the disease. In the human race, the best example is probably that of remedies employed in cases of fever and ague and malarial complaints. In such cases if, by the use of antiperiodics, such as quinia, the recurrence of the disease at its stated periods, in the form of either fever or chill, can be prevented, a marked progress has been made toward a cure.

Antispasmodics.—This term is applied to a class of medicines which are given on account of their property of preventing or affecting spasms ; they may be divided into two classes : stimulants, which are used in cases of extreme debility, and sedatives, which are used in cases of active irritation.

Alteratives.—A class of remedies which act upon the nutritive organs of the system, and, by reason of removing abnormal or improper material, assist in effecting a cure. Some writers apply this term to such medicines as produce the above effect without any increase in the amount of urine or other secretions, but this definition is scarcely necessary for the purposes for which we may use the term.

Astringents.—Medicines which have the property of drawing up or contracting certain tissues of the body and thereby lessening the discharges which are caused by disease. When this class of remedies are applied to the external surface of the body they are often styled styptics. Alum and oak bark may be given as familiar instances of this class.

Antilithics.—Which are given on account of their real or supposed power of dissolving or preventing the formation of calculi (stones) in the bladder and kidneys. Inasmuch as the formation of calculi is caused by an improper condition of the system, it is hardly probable that anything will remove them until this condition is changed and the proper condition restored.

Antiseptics.—Used to prevent or retard putrefaction and sloughing of external wounds, and which, by preventing or removing the matter thus formed, prevent its absorption into the system. As a general rule they act rather as removers of this kind of material, rather than as preventives.

Anesthetics.—Remedies which destroy the sense of feeling; they, in no sense of the word, cause cures, but merely relieve the pain and thus assist nature in her efforts.

Antacids.—Agents which neutralize or prevent the formation of acids and their attendant gases: lime water and the alkalies may be given as examples of this class.

Anodynes.—Equivalent to anesthetics; allay pain and quiet the nervous system; cannot be properly styled remedies, as they do not affect a cure.

Aromatics.—Agents which have an odor of spices; used to prevent the formation of gases, or, in the event of their formation to assist in their expulsion.

Cholagogues.—Applied to a class of medicines which, by acting upon the liver, increase the secretion of bile and assist digestion.

Cathartics.—Medicines which, by increasing the action of the intestines, increase the frequency of the discharges from the bowels and thus assist in the removal of injurious material from the system. Their action, by stimulating a greater or less portion of the intestines, increase the rapidity with which the contents are passed along and execreted from the system. They are divided into *laxatives*, *eccoprotics* and *aperients*, in accordance with the frequency and vigor of their action; when by overdose their action is greatly increased, they are styled *purgatives;* when dangerously active, they are called *drastic purgatives.*

Carminatives.—Such remedies as promote the throwing off of collected gases; their action in cases of colic is to allay the pain and prevent spasms by preventing the formation of gas.

Demulcents.—Medicines which form a coating over diseased surfaces and promote a cure; often used to allay pain in irritating diseases by excluding air from the injured surface. Gum arabic may be given as a specimen of this class.

Diaphoretics.—Such remedies as are administered for the purpose of increasing perspiration and thus reducing the temperature of the system; sometimes the term *sudorific* is also applied to this class.

Discutients.—External applications, which are applied for the purpose of increasing the secretions and reducing enlargements on the surface of the body. Used in cases of strains and external blows.

Diuretics.—Remedies administered for the purpose of increasing the action of the kidneys and to promote the increase of the discharges from these organs through the bladder in the form of urine.

Disinfectants (*antiseptics*).—Medicines which have the power to neutralize the offensive discharges from ulcers, fistula and similar diseases; they are not strictly remedies, but they play a not unimportant part in effecting a cure.

Expectorants.—Medicines which increase the formation of muscus discharges in the case of colds, catarrh, etc.; often given in diseases of the nasal passages.

Escharotics.—Remedies administered for the purpose of causing counter-irritation by inflammation on the surface of the body; this class is also sometimes termed *counter-irritants*, because, by producing an irritation which can be controlled, they relieve an irritation which is beyond the reach of the practitioner.

Emollients.—A class of remedies which are applied to the surface of the body for the purpose of softening the skin and to relax the tense condition of the inflamed surface; by relieving the surface tension, they also affect the deeper seat of trouble.

Errhines.—Remedies snuffed up the nostrils for the purpose of softening inflamed surfaces. The term *sternutories* is also sometimes applied to this class.

Emetics.—Medicines which, by their peculiar action upon the stomach, reverse its natural action and cause the discharge of its contents by way of the throat. Often used in cases of poisoning. Emetics, in small doses, become *nauseants, expectorants, and relaxants.*

Febrifuges.—Remedies which prevent fevers, or which lower the temperature of the body.

Laxatives.—Cathartics given in small doses; they produce a relaxed condition of the organ, and do not carry the effect far enough to cause cathartic action.

Nauseants.—Medicines which cause a slight degree of sickness, but not enough to cause vomiting; the best nauseants are emetics given in small doses.

Narcotics.—Administered for the purpose of causing sleep and quieting the nervous system, and assisting a cure in this way. In increased doses, they act as sedatives and produce complications which should be avoided.

Relaxants.—Which operate to decrease the tension of the muscles and muscular organs of the body, and, in some measure, remove the control of the patient over them; in many cases nauseants produce the same effect.

Refrigerants.—Remedies which are supposed to decrease the temperature of the body without seriously affecting the nervous system; their effect with many patients may be that of either a cathartic, diuretic, or even an emetic, as they affect the bowels, kidneys or stomach.

Stimulants.—Having more or less effect upon the whole system by bringing about a healthy circulation; some of this class appear to affect certain organs only, and hence, for the nicer purposes of practice, the class has been sub-divided into several parts.

Sedatives.—Remedies which diminish the action of the nervous system and the force of the circulation of the blood and other fluid portions of the body. They may be sub-divided in three sub-divisions, as they affect the circulation of the blood, reduce muscular action or diminish nervous symptoms.

Soporifics (*sedatives*).—Medicines which produce or cause sleep.

Sialogogues.—Remedies which are given for the purpose of increasing the flow of saliva and stimulating the salivary glands.

Stomachics.—Intended to increase the health action of the stomach and digestive organs, and which are administered in cases of indigestion and similar ailments.

Tonics.—Agents which strengthen weakened or debilitated organs, and which, in many cases, bring about this result by their action upon the nervous system.

Vermifuges.—Remedies which aid in the expulsion of worms from the intestines and anus.

There are numerous other terms used by veterinary writers, such as: *Hypnotics*, which cause sleep; *tetanics*, which act upon the nerves and produce twitching; *dilutents*, which increase the fluidity of the blood; *aphrodisiacs*, which are supposed to promote sexual propensities; *antaphrodisiacs*, which are supposed to decrease sexual propensities; *parturifacients*, which promote parturition; *abortives*, which promote abortion, and *detergents*, which cleanse the parts to which they are applied; but the definitions given are sufficient to cover any cases in what may follow, which will in any way confuse the mind of the reader.

The Action of Medicines.

In administering medicines to live stock the following points should be kept in view:

The horse has a small stomach, in proportion to his size, and in practice it is found best to use vegetable purgatives, which are less irritating than those in the mineral form: vegetable purgatives act but lightly upon the stomach proper, and reserve their main action until they reach the intestines.

Different classes of animals are not only differently acted upon by the same remedy, but they are also affected individually to a greater or less degree. Thus, tartar emetic, which, in small doses, will cause severe vomiting in the dog, will produce little or no effect upon a horse.

Vomiting with the horse becomes a very difficult action on account of the small size of the stomach, which does not appear to have sufficient muscular power to force its contents outward against the strong muscular ring with which the opening from the throat is guarded.

Finlay Dunn writes: "Most substances which act as emetics for men and dogs, are supposed to produce sedative effects when given to horses in sufficient doses; but the many sedatives available in human and canine practice operate uncertainly and imperfectly in horses, for which aconite is the chief reliable sedative."

Cattle require larger doses, in proportion to their weight, than other classes of live stock; this is due to the fact that

larger masses of food are, as a rule, to be acted upon, and that the numerously sub-divided stomachs have a function which is more mechanical than digestive.

Most medicines appear to, at least to some extent, lose their effect after they have been repeated for a considerable length of time. Thus, as in the human race, stimulants may be given until they either lose the effect or the size of the dose must be doubled or quadrupled. Finlay Dunn writes: "The continued use of a medicine sometimes alters the degree of its action. Caustics and irritants, which exercise only topical action, exhibit, on repeated application, gradual increasing activity. But many medicines, when continuously given, have their power considerably diminished. Thus, arsenic eaters sometimes use with perfect impunity twelve or fifteen grains of arsenic daily, a quantity sufficient to poison three or four unhabituated persons."

It has also been noted that climate and surroundings will more or less modify medicinal action; different diseases also modify the effect of the remedies given; the surroundings of the patient, as to ventilation and cleanliness, also have a material effect upon medicinal action.

In the following list, the doses are those for the medium-sized animal of each class, and must be increased or decreased to suit the weight of the patient, as compared with the average of its class. The doses named are also the minimum, or smaller doses, and may, in severe cases, be increased one-fourth, one-half, or, in extreme cases, doubled:

Nature, Properties, Effects and Doses.

Aconite.—A tincture made from the roots and leaves of plants belonging to the Aconitum family, and better known by their representatives, Monkshood, Friar' scap and Helmet plant; the tincture usually used in this country is made from the Monkshood, (Aconitum Napellus); it is a sedative, anodyne and diaphoretic; in excessive or improper doses it presents alarming and dangerous symptoms; its main use is in decreasing and controlling fevers, and in rheumatic complaints; it also affects and controls the action of the heart. It is valuable in milk fever and also in cases of diseases of the heart. Horse, thirty drops; cow, thirty-five drops; given with water.

Alchohol.—A stimulant, intoxicant, diuretic and diaphoretic; it is largely used in the preparation of tinctures, and these, when prescribed in large doses, often produce unexpected effects, on account of the action of the alcohol which they contain; when diluted with two parts of water to one of alchohol, it becomes the "diluted alcohol" of the druggist. Horse, two and one-half ounces; cow, three ounces; given with water or other liquid.

Aloes.—Usually found under three names, given on account of slight variations in the character of the product and on account of the location in which it is produced; thus, we have Barbadoes aloes from the *Aloe vulgaris; Socotra aloes*, from the *A. socotra* and African aloes from the *A. spictai.* It is a strong purgative, and in overdoses produces injurious effects, but in veterinary practice it is largely relied upon for its action as a purgative. Horse, four drams; cow, four to five drams.

Alum.—Sulphate of alumina and potash; will dissolve in about fourteen times its weight of water; a strong astringent; it is used to stop hemorrhages, and in cases of dysentery; dissolved in water, it is an excellent wash for collar sores and for any abrasion of the skin; the solution should be kept in the stable at all times, and used as a wash for sore teats, saddle galls, etc. Dose, internally, horse, two and one-half drams; cow, three drams. It is useful for destroying and preventing the abnormal growth on ulcers, known as "proud flesh," but for this purpose it must be "boiled," and is known to the trade as "burnt alum." As a veterinary remedy, it is useful in cases of colic and similar diseases.

Ammonia.—(Aqua ammonia or spirits of hartshorn) is a stimulant, diuretic and antispasmodic; internally and undiluted, it is a powerfully corrosive poison, and is dangerous in inexperienced hands; it is seldom used internally and usually constitutes an ingredient in washes and lotions; in some diseases it is useful for counteracting acids and their action; applied to the skin in an undiluted form, it is a mild blister and counter-irritant; muriate of ammonia (*sal ammoniac*), may be used instead of the aqua ammonia, and by some is preferred; for outward applications, four drams of sal ammoniac may be dissolved in a pint of water; if accidentally administered in excessive doses, the best antidote is vinegar or lemon juice.

Horse (internally), one-half ounce; cow, half to three-quarters of an ounce.

Arnica (tincture).—Prepared from the flowers of the *Arnica montana*, or Leopard's bane; increases the pulse, excites the kidneys, and is useful as an outward application to wounds and bruises; in some conditions of the system it acts as a stimulant, but it is possible that this action may be due to the alcohol used in the preparation of the tincture. Horse, (internally), one dram; cow, same amount; given with water.

Asafetida.—A gummy material obtained from the juice of the *Ferula asafetida;* an inferior article is also made from the *Narthex asafetida;* the root is sliced, and as the gum exudes and hardens, it is scraped off; this drug is much adulterated; acts as a stimulant, expectorant, vermifuge and antispasmodic; a tincture is prepared by dissolving four ounces of the gum in one quart of alcohol; the tincture, in a diluted form, is sometimes used as an injection for worms near the outlet of the rectum; horse, two and one-half drams; cow, three drams. May be given in a ball or rubbed down in water; the tincture is not usually given internally.

Antimony (tartar emetic).—Acts as an emetic, a sedative and diaphoretic; applied of full strength externally, it acts as a mild blister; horse (as a sedative), two drams; cow, three drams.

Aromatic ammonia.—A stimulant, diuretic and antispasmodic; in some diseases used to counteract the formation of acids; horse, one and one-half ounces; cow, two and one-half ounces.

Arsenic.—A dangerous poison; not to be used by an inexperienced person; acts as an alterative and nerve-strengthener; horse, four grains; cow, six grains. Use not advised if it can be avoided.

Acetic acid.—A stimulant, and, applied externally, a counter-irritant; diluted with seven to ten parts of water, it forms the vinegar of the housewife. Horse, one dram; cow, one and one-half drams.

Balsam copaiva.—Is the solidified juice of a South American tree; is very often adulterated with castor oil and oil of turpentine; is a stimulant, expectorant and diuretic; is mainly used on account of its action upon the kidneys and urinary organs;

when reduced by the addition of a liquid, it is an excellent external application for obstinate ulcers, but for this purpose should be reduced with water. Horse, three drams; cow, three and one-half drams.

Belladonna (*extract*).—Prepared from the leaves of the *Atropa belladonna;* it acts as an anodyne, antispasmodic and narcotic; is an unsafe remedy in the hands of the amateur practitioner; in excessive doses, is a powerful narcotic poison; it is very valuable in all diseases of a spasmodic character; is sometimes used in rheumatic and neuralgic diseases. Horse, two drams; cow, two and one-half drams. Given as a powder; horse, two ounces; cow, same amount.

Benzoin.—Obtained from a tree growing in Sumatra; the juice of the tree flows out through incisions made in the bark, and is collected when solidified; if perfectly pure, it is entirely soluble in alcohol; acts an an expectorant, antispasmodic and (in certain diseases) as a stimulant; used largely in all diseases of the mucus membrane and in colds; seldom pure. Horse, one ounce; cow, one and one-half ounces.

Bismuth (*sub-nitrate*).—A white, metallic powder used as medicine in cases of inflammation of the stomach or bowels; soothes all kinds of irritation; useful in indigestion, dysentery and similar diseases. Horse, two drams; cow, three drams.

Borax.—Used in a solution with water is useful in the destruction of parasitic life; internally it quiets the nerves and stimulates the kidneys; to wounds in the skin, with water, it acts as an astringent, and is sometimes used as an application to ulcers and obstinate sores. Horse (internally), four drams; cow, three-quarters of an ounce.

Buchu.—Prepared from the leaves of a South American shrub (*Barosma crenata*); acts as a stimulant, antispasmodic, tonic and diuretic; used in urinary diseases; supposed to be beneficial in cases of stone in the bladder. Horse, four drams; cow, half ounce.

Boneset.—A common plant, sometimes known as Thoroughwort (*Eupatorium perfoliatum*), acts as a stimulant, diaphoretic, tonic and emetic; the warm infusion of the dry leaves is a mild emetic, but if steeped in cold water, or, if the infusion is allowed to become cold, much of its power as an emetic is lost; in large doses, in the absence of anything more active, may be used as an emetic in cases of poisoning; if given with other emetics, it

appears to increase their action. Horse, three-quarters of an ounce ; cow, one ounce.

Bluestone (*Copper sulphate*).—A metallic remedy ; in large doses a dangerous poison ; in mild doses an astringent and tonic ; mainly used, with water, as an application to ulcerous sores, foul claw, foot rot and kindred troubles ; internally it acts as a tonic ; for ophthalmia (sore eyes), if dissolved in water, at the rate of five grains to two ounces of water, it forms an excellent wash ; in double this proportion, it may be used as an external application. Horse (internally), one-half dram ; cow, one dram.

Bromide of Potassium.—A colorless salt with peculiar shaped, quadrangular crystals ; very soluble in water ; acts as a sedative to nervous action ; useful in scrofulous diseases of all kinds; one dram of the bromide with an ounce of lard forms a valuable ointment. Horse (internally), three drams ; cow, four drams.

Balsam of Peru.—Obtained from a South American tree (*Myrospermum Peruiferum*), by making incisions in the bark and collecting the exuding juice as soon as solidified ; is of a dark, reddish color, and soluble in alcohol ; is a stimulant, expectorant and anti-spasmodic ; useful in colds, catarrh, etc.; made into an ointment with equal parts of lard or tallow it is excellent for external sores of all kinds. Horse (internally), one ounce ; cow, one and one-fourth ounces.

[To be continued.]

GENERAL PATHOLOGY OF THE LYMPHATIC SYSTEM.[1]

By F. H. McCarthy, V. S.

The lymphatic or absorbent system is connected with the blood-vascular system, and consists of a series of tubes which absorb and convey to the blood certain fluids. The tubes lead to lymphatic glands through which the fluids pass to reach the right lymphatic vein and thoracic duct, both of which enter the venous system near the heart. Through the excessively thin

[1] Read before the Schuylkill Valley Veterinary Association.

walls of the capillaries the fluid part of the blood transudes to nourish the tissues outside of the capillaries; at the same time fluid passes from the tissues into the blood. The fluid after it passes into the tissues constitutes the lymph and acts like a stream watering the tissue elements. Much of the surplus of this lymph passes into the lymph vessels, which can hardly be treated as independent structures, since their walls are so closely joined with the tissues through which they pass, being nothing more than spaces in the connective tissue until they reach the larger lymph vessels and finally empty into the lymph glands. These lymph glands are structures so placed that the lymph, flowing towards the larger trunks, passes through them, undergoing a kind of filtration. The lymphatic structures, from their delicate anatomical formation, are subject to many pathologic changes, as in inflammation of surrounding parts. It may be acute, as we often see it the result of some direct injury from a wound, nail in the foot, injuries to the groin; in Peyer's patches and the solitary glands of the intestines, the result of irritation of the intestinal mucous membranes or septic infection. An affected gland becomes intensely vascular, and the seat of free exudation; the escaping leucocytes accumulate in the tissues until all distinction of medulla and cortex has disappeared, the gland becoming soft, pulpy and perhaps dotted with hemorrhagic effusions. Upon the removal of injurious influences the process gradually subsides, the elements undergo disintegration and absorption, the gland returning to its normal condition.

In other cases the process goes on to suppuration, the trabeculæ are destroyed, many of the cells disintegrate and the gland becomes filled with pus. This is usually associated with suppuration of the surrounding connective tissue and gives rise to what is known as a "follicular" abscess. In scrofula we have a chronic inflammation with but little tendency to resolution, organization or suppuration, but with marked tendency to progressive infiltration and caseation. In typhoid fever the lymphatic glands of the intestines, Peyer's patches and the solitary follicles show many characteristic changes. The primary change here consists in a hyperemia and cell infiltration of the gland. Many of the cells increase in size, and Peyer's and the solitary glands become considerably enlarged and prominent. They are of a grayish-white or pale-reddish color

and brain-like in consistency. The process now passes into the second stage, that of death and disintegration of the newly-formed tissue. Many of the new elements become fatty and are absorbed. In others the follicles of the gland rupture, discharge their contents externally, the patches then acquiring a peculiar reticulated appearance. The most characteristic change, however, is the formation of the typhoid ulcer by the sloughing of the dead tissue. The third stage is that of cicatrization, which takes place by the resolution of the peripheral infiltration and the gradual formation from the margin of the epithelial covering, the gland structure not being regenerated. In glanders, that dreaded disease, we have the cervical and sub-maxillary glands swollen and indurated from infection through the lymphatics, which become swollen, hard and knotty, the glands being greatly enlarged.

Pathologic changes in the lymphomata are characterized by the enlargement of the lymphatic glands in various parts of the body; in the internal organs, especially the spleen, by a diminution in the number of red corpuscles and progressive anemia. At first only a single group of glands may be affected, but subsequently the process may become general throughout the whole body. The new growths, which in their earlier stages are limited to the glands, gradually break the capsule and become confluent, forming large masses, as polypi, mediastinal tumors, etc. The progressive anemia accompanying it is due to the consequent interference with the formation of the blood corpuscles. Hypertrophied lymphatics sometimes attain an enormous size, and seriously interfere with adjoining organs, as in pressure upon the larynx and recurrent laryngeal nerve, causing wheezing and roaring. They sometimes undergo calcification, or occasionally contain a cheesy deposit. A condition similar to this may be induced by chronic inflammation; in such cases, however, the gland structure may become lessened, as the result of pressure, by an increase of fibrous or connective tissue, although a large tumor at the site of the gland remains. This may become gradually absorbed, or recurrence of inflammation may take place and abscesses form. If in the inguinal region, they at times undergo suppuration; pyemia may supervene and prove fatal. In tuberculosis the cortical portion of the gland is first affected. In the earlier stages of the process small pale-grayish nodules are often visible, scattered through

the cortex, gradually increasing in size and becoming caseous. The gland in the mean time becomes enlarged from the tubercles and cell infiltration, the medulla and cortex indistinct, the whole presenting a grayish, homogeneous mass. The cell infiltration frequently undergoes marked fibroid development, the capsule thickening and the caseous mass is surrounded by a fibroid structure; the caseous substance may subsequently calcify. The glands most commonly affected are the bronchial, mesenteric and cervical groups.

PERICARDITIS IN THE COW.

By Dr. W. H. Ridge,
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Definition.—An inflammatory affection of the parietal and visceral layers of the pericardium.

History and Causes.—Pericarditis may be acute or chronic, idiopathic or secondary in origin. But the disease we desire to study more particularly is pericardits, due to traumatisms. The bovine class, from their nature and anatomical peculiarities, are predisposed to this trouble, caused by foreign bodies, such as wires, nails or other sharp-pointed objects, passing from the second stomach (reticulum), through the diaphragm and perforating the pericardium; while in the horse and other animals, in which the stomach is somewhat removed from the diaphragm, we seldom, if ever, witness this affection. It is remarkable how numerous are the foreign bodies to be found in the reticulum of the cow. One case we have in mind in which a piece of wire thirteen inches long was found to have passed from the reticulum into the chest cavity. We have seen several cases where the wire was from four to six inches in length; but all the cases of traumatic pericarditis are not caused by such large objects, many being caused by smaller objects, as needles, which are much more difficult to find.

Anatomical Lesions.—The animal should be carefully opened on the left side. The pleura generally has made adhesions, that is, portions of the lungs have made adhesions with the costal pleura On breaking these adhesions we are amazed

at the great volume of the pericardium, often filling two-thirds of left side of the chest. We will now pass to the most diagnostic lesion, namely, the adhesions of the pericardium to the diaphragm. We have never seen a case where this lesion did not exist. Dissecting these adhesions, we will come to a point where the exudate is stronger, forming a canal which leads into the reticulum, or perhaps in some cases it has closed, leaving a line of connective tissue which has a different color on section.

In some cases we find a serous fluid in the pleural cavity, but mostly it is confined to the pericardial sac. In cases far advanced we find subcutaneous edema, especially at the sternum. On opening the pericardial sac, the pericardium is greatly thickened and the cavity filled with either a fibrinous or a serous exudate to the extent of several quarts. This exudate may be mixed with pus or red blood-corpuscles, sometimes with fluid from the reticulum, in which case the decomposition produces a very purulent fluid. This fluid may be a clear, serous exudate or dark colored, containing flakes of fibrin, or fibrin may fill the pericardial sac and having adhesions with both the heart and inner coat of the pericardium, may firmly unite the pericardium and heart. In such cases the pericardium has a leathery, corrugated appearance or sometimes the fibrin is deposited in the form of a layer or series of layers on the visceral and on the parietal surfaces of the membrane. It is a peculiarity of this fibrinous pseudo-membrane that its free surface has a shaggy appearance, due to the projections of a number of filaments and villous processes.

The heart muscle undergoes a fatty degeneration, due to lack of nutrition. The heart is filled with blood, the organ stopping in diastole. The endocardium has ecchymotic spots covering its surface. We may find congested or inflamed areas in the lungs, often due to the object injuring the lung. We nearly always find hypostatic congestion of the lungs, especially in advanced cases.

The foreign body is mostly found in the posterior part of the pericardium, leading from the diaphragm; but in one case we found one sticking in the eighth rib; another passed from the reticulum to the pericardium and then back into the abdominal cavity. Another was found free in the pericardial sac. It is often remarkable to what distance the object travels after it has produced a fatal pericarditis, as some cases live for two or three

months after the pericarditis is marked. The abdominal organs are mostly normal, except in an anemic condition.

The symptoms we would divide in three stages. The first symptoms resemble indigestion so clearly that we think it can not be distinguished from the latter. We have a loss of appetite, nose dry, generally constipation, with the temperature somewhat elevated. Lactation is diminished, the back is somewhat arched. After giving a purge, we mostly find the feces tinged with bood. We have seen this in cases where constipation existed, the feces being streaked with dark lines, which on close examination will be found to be blood. The animal being very dull, may remain in this condition for several days, usually about one week. Then the second stage of symptoms makes its appearance; the temperature rises to about 103° to 104°F.

We now have symptoms closely resembling tuberculosis ; we get a pericaritic friction-sound in the left side and perhaps a slight pneumonia with a cough and with great disinclination to move. Appetite capricious, muzzle still dry, coat staring, emaciation becoming marked.

Any purgative now given is most likely to set up a profuse diarrhea. Tonics and judicious treatment may ameliorate the symptoms enough, even at this stage, to make the symptoms much less marked.

The third stage of symptoms includes arched back, can scarcely be made to move, friction sound over the heart, which soon changes to the "splash" of the fluid; at every beat of the heart or when the fibrin is the chief exudate, a dull muffled sound, with a weak, frequent pulse; on making the animal move, it makes a peculiar grunt, holding the head low, and walks with a cautious tread, the little exercise making the heart-action accelerated and so loud as to be heard while standing a few feet away. When the exudate is fluid, the peculiar sound of the heart can be heard on the right side as well as on the left. We may still have sibilant rales in the lungs and friction pleural sounds in localized spots. The animal becomes more emaciated; substernal edema makes its appearance. The temperature remains high, about 104 to 105° F., until near the end, when it usually drops to 98° F., or even lower. The animal usually has a very suppressed cough; the respirations are short and aborted, as if it were trying not to take a deep

inspiration. Lactation is suppressed; often a succession of chills during the last two stages.

Diagnosis.—First, we will have to differentiate it from indigestion. We think the passage of blood is a diagnostic symptom; although we may have the passing of blood with the feces in other complaints, yet we have seen it in so many instances of traumatic pericarditis that it makes us feel quite positive in our diagnosis. The peculiar grunt when made to move is also very characteristic. The friction heart-sound followed by the sound of fluid or muffled sound of the heart are truly diagnostic, especially after slight pleuritic sound over the posterior part of the left lung. The substernal edema following the train of other symptoms would make us feel sure of traumatic pericarditis. Then, of course, the last confirmation is the autopsy, and the dignostic sign will be the channel leading from the reticulum to the pericardium. It would make no difference to our mind whether we found the object or not; as long as we saw this evidence of the passage of the foreign body, the pericarditis was a traumatic one.

Prognosis.—This is *grave.* We have not been fortunate enough to see an animal recover.

Causation.—From the peculiar appetite of the cow, which will eat almost anything, the natural consequence is that many foreign bodies accumulate in the reticulum. If of the nature of wire or nails, they will corrode until the end becomes very sharp; then when the cow (for it most often happens in this animal) is in late gestation, the bulk of the fetus pressing the reticulum firmly against the diaphragm, the sharp point becoming pressed toward the heart, with the steady pressure on one side, and constant thumping of the heart on the other, the object is driven toward the heart. Nearly all our cases were observed soon after parturition. Probably the act of parturition has a tendency to force the object through the reticulum.

Treatment.—At the first symptoms, before the object has entered the pericardial walls, have a Roentgen skotograph made of the animal, locate the object and then perform rumenotomy. I will cite a few cases, more particularly to note the length of time the animal lived after the first symptoms were manifest. I will give Nos. 3 and 4 more fully, as one had fluid in the pericardial sac, while the other was filled with fibrin.

No. 1. Cow examined February 19, 1891; had been ailing for some six weeks and treated by the owner. On standing in front of her we could see the intercostal spaces move in and out at every respiration; she was emaciated; temperature elevated. She had had a cough, sibilant rales in left lung, roughened breathing in centre of right lung. Diagnosis, tuberculosis. She was sent to the veterinary department, University of Pennsylvania, and examined by several veterinarians, who pronounced her tubercular. She was tested with tuberculin, which did not react, and gave birth to a live calf a few days after. I have no date of her death, but the autopsy revealed traumatic pericarditis, due to a wire thirteen inches in length (a piece of telegraph wire).

No. 2. April 13, 1891. Cow; diagnosed pharyngitis from the cough and difficulty in swallowing. April 22, ausculted fluid in the pericardial cavity; diagnosed traumatic pericarditis. April 28 she died. Autopsy revealed a large nail which had penetrated the pericardium and into the heart. She had a calf a few days before ailing.

No. 3. June 1, 1892. Cow; refused to feed, was panting and seemed in pain; temperature, 103; was hooked by another cow; she was due to calve. June 7 calved without trouble. June 12 owner came for medicine, saying the cow was constipated and passed some blood with feces; held the head low, and would not move voluntarily, and grunted when made to move; the back was arched. Gave sodii sulph. Saw her June 16; still passing some blood, but eating better; the owner thought her much better; could hear friction sound at every heart beat; diagnosed traumatic pericarditis. In a few days she had substernal edema; on ausculting the heart we could hear the splash of the water at every beat; also, could outline the dullness on percussion, showing a large amount of effusion; became very emaciated and weak; died on the twenty-eighth. Autopsy, pericardium distended with fluid; a piece of baling wire caused the trouble.

No. 4. May 8, 1894. Cow; threatening abortion; colicky, constipated. May 9 gave sodii sulph., when she seemed to improve. May 18 could hear friction sound in posterior part of the lung; she had a cough and grunted when forced to move; the elbows were turned out; the respirations increased. May 18 diagnosed tuberculosis; tested her with tuberculin.

Temperature: 8 p. m., 104°; 12 m., 103.6°; 2 a. m., 104.2; 4 a. m., 104°; 5 a. m., 103°; 6 a. m., 103.6°. The heart-beat muffled; sounded as if there was a large tubercular mass between the ear and heart; no diagnosis. On May 25, the heart-beat could be heard over a large area, but sound was muffled, as if tied to the ribs; there was substernal edema. Diagnosed pericarditis and thought it traumatic, and asked to have the animal killed. June 4 killed the animal; the edema was diffuse, extending up to the head, nearly closing the eyes. Autopsy showed that a piece of wire had traversed from the reticulum to the pericardium, passed downward and turned backward into the abdominal cavity under the reticulum. The pericardium was about one and one-half inches thick; the fibrinous exudate had attached the pericardium so tightly to the heart that it was almost impossible to find any resemblance to a heart; no tuberculosis in any part of the animal. The wire was a piece of baling wire.

No. 5. January 4, 1895. Cow, belonging to the same owner as No. 4. Had had diarrhea for some time, which recurred as soon as treatment was stopped; diagnosis tuberculosis from the excessive diarrhea and friction rales in left lung at the posterior part; also passed some blood with feces. January 7 tested with tuberculin; temperature 8 p. m., 100.5°; the temperature did not rise above 101.2°, while at 10 a. m. the next day it was at 101° F. She seemed to improve up to January 24. On March 1 we found her in a typhoid condition, temperature about 104°, not eating, diarrhea, emaciation. On March 14 we found fluid in the pericardial sac. March 25 had her killed. The autopsy the same as the above cases.

No. 6. April 9, 1895. Cow; commenced ailing soon after calving; had a cough and moaned a great deal; not eating; from external appearance was tubercular; respirations frequent; sibilant rales in the left lung; temperature varying from 102° to 104°. April 17 injected 3-10 c.c. tuberculin; 8 p. m., temperature 102.5°; 2 a. m., 103.4°; 4 a. m., 103.2; 8 a. m., 101.4°. Auscultation of the heart revealed fluid in small quantity. Diagnosis traumatic pericarditis; died on April 23. Autopsy showed a piece of wire had passed to pericardium, then passed out and penetrated about one fourth of an inch into a rib.

No. 7. February 4, 1894. Cow; recently purchased; was in pain and passing hard feces with blood; temperature 104°. We

thought it impaction of the omasum; gave sodii. sulph.; the bowels were relaxed, but blood marked every passage. On February 8 she aborted. February 11 we could detect friction sound in the heart; on the fourteenth water was plainly heard; on the eighteenth the owner had her killed, and told us there was a piece of wire in her heart.

No. 8. January 2, 1896. Cow; belonging to same owner as above; history of being hooked by another cow; intermittent pains until January 7; moaning nearly all the time, especially when moved; bowels constipated; gave laxative, which acted nicely; she commenced to feed again for a couple of days, when on the thirteenth we could find friction sounds on the left side. On the twenty-sixth she had a dead calf. The pericardium now filled very rapidly. She died on February 2. Autopsy showed a wire free in the pericardial sac, which object was about five inches long. There were also in the reticulum three pieces of wire, one long wire nail four screws, three lath-nails, one piece of stone and two tacks.

No. 9. January 4, 1896. Cow; all the appearance of indigestion; the owner had given linseed oil. January 5 no movement of the bowels. We gave sodii. sulph. No movement until the eighth, when she seemed much better, eating well. January 9 calved without trouble. January 18 detected friction sounds in heart; on the twentieth found edema and fluid in pericardium. She died two days afterward; no postmortem.

Remarks.—You will notice nearly all the cases showed a piece of baling wire causing the trouble. All the owners used New York manure for fertilizer. This manure contains a great deal of baling wire, much more so than Philadelphia manure. The wire is raked up in the wheat rakings, then run through the threshing machine, cutting it up in small pieces. The cows eat this straw containing the pieces of wire, which lie in the reticulum for variable periods.

To avoid infection, avoid uncleanliness. A while ago this journal cautioned against the use of cobweb to staunch bleeding. Now we read of a fatal case of tetanus (lockjaw) caused by the application to a wounded thumb of a poultice made from material contributed by the cow stable. In the light of our nowaday science it is easily understood why the use of such excrementitious matter, or any dirty applications are dangerous.

EDITORIAL.

THE FUTURE OF THE VETERINARIAN.

Apropos of the future of the veterinarian, his field, while possibly lessening in one dimension, will enlarge in another. The remarks of the *American Veterinary Review* on this subject, in reply to an article appearing in the *Turf, Field and Farm*, are very happy. The substitution of electric power for horse-power in some departments of transportation, the over-production, and a panic, all at the same time, tend to make the superficial aspect of the case more striking. But panics will come, and panics will go, horses will continue to be produced, and the veterinarian will continue to have his vocation. The particular department of medicine in which the veterinarian should take part is in the prevention of disease, applying his knowledge of comparative pathology, sanitary science and the modes of transmission of disease, in directing measures that protect the public health. It is in this particular direction that a wider field is opening; it is in this channel that one who is properly adapted will find fruitful employment.

Our condition here has been very much similar to that of the veterinarian in the United States army. The conditions for a time may have been prohibitory, but now they are changed. A more extended knowledge of diseases, their method of propagation to more than one species of animal, careful instruction in histology and bacteriology has placed us under different conditions. In these days of toxins and antitoxins, when the lower animals under the watchful eyes of the veterinarian are utilized in curing and preventing diseases in man, when disease can be transmitted from a domestic animal to man, from a favorite animal to his master, when entire epidemics of a disease of persons can be traced to diseases in dairy cows or contaminations from bad stable arrangements or vile sanitary conditions, when persons die from diseases contracted from animals, but not recognized until suggested by the veterinarian, when all these, and many more conditions will exist, and they do so now, we have entered a field where we can find new work which will have a permanent influence

upon our fellow-beings. Each one can in a measure voluntarily exert such influence, in his own particular territory, but with much less effectiveness of purpose than if he were to do such work in an official capacity. It is not for the purpose of self-laudation, of booming our profession, that we would urge the official recognition of the veterinarian on boards of health, slaughter-house and public marts; but the way is gradually paving itself to that end, the sign of the time indicates that such places will eventually be occupied by a veterinarians who will be important factors in directing the results. Yet, how many slaughter-houses furnishing food for thousands of people, and how many boards of health, city and state, do not seem to recognize that their organization is not complete until it includes a member with broader views on comparative pathology and sanitation! Every state, city or borough of sufficient importance to support a board of health or a slaughter-house should have a qualified veterinarian as one of the public officers. He should be considered, on boards of health, of importance equal to that of the physician.

We received with delight the twentieth annual volume of the *American Veterinary Review*. What it has done for the veterinary profession and veterinary journalism in this country every one of its readers knows much better than can be detailed in words. This can be judged by the improvements on its pages and the enthusiasm of its editors. We congratulate the *Review* from our knowledge, both professional and personal, upon the acquisition of Dr. Roscoe Bell to its editorial staff. Prosperity is our wish.

To stop an entire army to nurse a wounded soldier would be such poor generalship as to insure the positive court-martialing and dismissal of the commanding officer. Yet this is practically what the legislature of New York has done. The law regulating the practice of veterinary medicine and creating a State Board of Examiners has been temporarily suspended and nullified in order to enable one individual to register and thus escape the requirements of the law. If one can claim such a privilege, all have this right. The injustice of such action is only too apparent. It may be "political," but for such an outrageous act censure is too mild a punishment.

NOTICE.

The editors of the MAGAZINE extend their obligations in expressing a desire to learn through its readers, directly or indirectly, of such veterinarians as have any official connection with state or local boards of health, or who are in any degree consulted as to the sanitary regulations in any city or borough; also of what nature their work consists. Such information should be addressed to our editorial office.

A CORRECTION.

We desire to make the following correction on page 170 of the March number of the MAGAZINE, in Dr. Hinebauch's article on "Feeding Millet to Horses." Dr. Formad's letter should have added, after the word spring: *The kidneys are in a state of sub-acute catarrhal nephritis. There is also a slight granulation of the epithelium, cloudy swelling which is a forerunner to the more grave degenerative process and leads most frequently to fatty degeneration.*

We regret the typographical error and hope the readers of the MAGAZINE have not been mislead by the omission.

TRANSLATION.

CHARBON.* (Anthrax).

Selected and Translated by Arthur S. Wheeler, V. M. D.

Charbon is a general, virulent and inoculable malady, common to the principal domestic species and to man, and is due to the presence in the organism of the bacteridium of Davaine.

It is also designated charbon bacteridien, an expression very precise, and preferable to the various other titles, although there still persist in current language the names of anthrax and *sang de rate*, which refer rather to certain local alterations.

Symptoms.—Charbon reveals itself by different manifestations according to the species considered. Beside the symptomatic changes inherent in the rapidity of its evolution, the disease is invested with different expressions according to the mode of inoculation. In the horse and ox, for example, there are distinguished an *internal charbon*, due to the penetration of the virus through the alimentary tract, and *external charbon* much more rare, which may be consecutive to a breach in the cutaneous tissue. The hog is likewise affected in a particular way.

Charbon of the Horse.

A. Internal Charbon.—(*a*) The beginning is marked by a state of prostration, after which from time to time the disease is manifested by colics, at first mild, then more and more violent. During the calm periods, the animal holds his head extended somewhat, his aspect fixed and his eyes without expression. During the paroxysms he paws the ground; lies down, gets up and looks at his flanks; he squats frequently; he often passes almost liquid dung.

The general symptoms are very marked; the temperature becomes elevated in several hours to 41°–41.5°; the conjunctive and other mucous membranes are deeply injected. From the outstart the beatings of the heart are violent, tumultuous and accelerated (70 to 100 per minute); one hears, on auscultation, a murmur of almost metallic pitch; the artery is hard, tense, voluminous; the character of the pulse, thready and almost

* Selections from Professor Nocard's recent work entitled, "Les Maladies Microbiennes des Animaux Domestiques."

imperceptible, contrasts with that of the cardiac pulsation. The respiration remains almost normal; but at intervals more or less prolonged, it becomes during several minutes hurried and labored. The extremities are alternately hot and cold; with the hand one perceives muscular tremors in the regions of the shoulders, buttock and the croup. The sick animal is insensible to external excitations; he moves with difficulty; the legs are lifted with reluctance.

In several hours the troubles are modified and accentuated; more commonly the colics disappear, leaving the animal in a state of complete prostration. The temperature oscillates around 41°; the mucous membranes, deeply injected, have a dark-red tint, or are cyanosed; the conjunctiva shows minute ecchymoses. The beatings of the heart, always quickened, have diminished considerably in violence; a venous pulse exists; the artery remains hard and tense; the arterial pulse is more or less effused. The respiration is short, quick, embarrassed during certain movements; quiverings and chills are noticeable in the region of the olecranon muscles. It produces sometimes a paroxysm of vertigo; diarrheal matters stained with blood are rejected from time to time. Weakness is extreme; if one compels the animal to move, one observes that the legs drag along the ground, and that the gait behind is very unsteady. The skin has lost its suppleness; the hairs are dull and dry; the hair of the mane comes out very easily. In certain cases one observes swelling on the body and in the regions of the throat.

Bleeding practiced at the jugular gives black blood, of a viscous consistency, which remains uncoagulated or gives nothing but a black and diffluent clot. The blood flows sluggishly; it is with the greatest difficulty that one obtains three or four litres of blood. No matter how much care one displays in closing the wound made for the bleeding, a large thrombus forms, due to the loss of coagulability of the blood.

Under this form the disease never retrocedes. In the last stage one observes agitation and convulsive tremors of the muscular groups; sweating appears in certain regions; they become general rapidly; the limbs bend, with a jerky motion in the region of the pastern. The continual efforts at defecation are followed by the rejection of liquid matters, of a deep brown color; the rectum appears like a dark swelling. The

urine is often bloody. The breathing is anxious and hurried; the countenance is drawn; the extremities cold; the animal falls; the pupils are dilated and death ensues during a period of coma, or during a convulsion. The evolution is complete in eight to thirty hours. Sometimes the animals fall as if thunderstruck after a few hours of sickness.

(*b*) Besides this mode of evolution, internal charbon also manifests itself much less distinctly. It begins by diverse symptoms, such as sluggishness in working, shortness of breath, diminution of appetite. Sometimes we find associated with these vague symptoms other manifestations; such as intermittent muscular tremors, diarrhea, red color of the urine, mild and spasmodic colics, or extensive variations of temperature, which oscillates from 38° to 40° and 41° C. in a few hours. At certain moments the animal appears restless; he frequently changes his weight from one leg to another; the movements of the heart are stronger than normal.

All these signs are generally insufficient to make one suspect charbon. There is, however, another symptom, which shows itself frequently, and which, associated with the preceding, possesses a real diagnostic value: it is the appearance of a lameness without apparent cause, and of a variable intensity, often located in the hind leg.

After twenty-four to thirty-six hours the conjunctivæ assume a saffron tint; the beatings of the heart, somewhat violent, have a metallic ring; the pulse is small and scarcely perceptible. These symptoms persist during a variable time; the respiration is hurried at certain moments; tremblings occur; one observes diarrhea; the temperature gradually descends in the neighborhood of normal.

In the last stage the symptoms are accentuated and hastened; the mucous membranes become cyanosed; the throbbings of the heart are violent; the chills and tremblings are permanent; sweatings appear; the patient groans, grinds his teeth, and death comes quickly.

This subacute evolution is complete in two to six days. One is able to admit, *a priori*, that a cure is possible after the commencement of infection, but it is difficult to prove this fact by reason of the possible errors of diagnosis.[1]

[1]This form of charbon has been known for a long time in Beance in the horse and ox. The peasantry designate it *sang lent*.

B. External Charbon.—The first sign observed consists in the appearance, in the vicinity of the shoulder, of the neck, in the region of the groin, of the throat, or on the head, of a hot, edematous and painful tumor, which acquires in six to twelve hours cousiderable development. The appetite has almost completely disappeared; the temperature rises rapidly to 40°–41.5°, the pulse is small and quick; the beatings of the heart are violent, tumultuous, and of a metallic pitch. The patient is dull and insensible to noises.

In the absence of a rapid intervention, the symptoms are pronounced. The tumor gains in extent; localized primarily on a line with the shoulder, it extends forward over the whole surface of the neck and shoulders as far as the parolid region, at the same time it extends to the throat and the thoracic wall. Developed in certain regions, the tumor gives rise to particular accidents; in the groin, it determines complete mobilization of a posterior member, which is thrown outward; in the vicinity of the throat it occasions a hardening, dypnœa and death by asphyxiation.

When the infection is generalized the symptoms observed are those of internal charbon and death takes place three to eight days after the onset of the disease.

If an attempt be made to check it from the beginning, we sometimes produce a cure; the tumor ceases to develop; the general symptoms persist during several days, then diminishing gradually, and a perfect recovery may be realized in six to eight days.

Charbon of the Bovidæ.

A. Internal charbon.—(*a*) The infection is ushered in by an intense fever, which accompanies the ordinary signs of acute, grave diseases. The appetite is almost nil; rumination is suspended; the animal is restless, his countenance fixed, and he is indifferent to what goes on around him. The skin is dry, the coat staring; one observes chills and localized muscular tremors; they do not flinch across the loins: with cows the secretion of milk is suddenly arrested.

The throbbing of the heart is quickened and violent and of a metallic pitch; the artery is hard, tense and voluminous, whereas the pulsation is small and thready. Respiration becomes at certain intervals quick, short and embarrassed, to

recover its normal rythm during periods of calm. The mucous membranes are injected. The patient spreads himself and urinates frequently. After several hours there is complete prostration ; the animal moves with reluctance ; sweats appear in certain regions. The beating of the heart, always increased, is notably diminished in violence ; the pulse is imperceptible ; there exists a distinct venous pulse. The conjunctivae ecchymosed, assume a cyanosed tint ; in the vicinity of the lower lip, the venules trace out an elaborate arborization of a deep color.

In some instances colics develop, accompanied with moanings, with slight meteorization and the rejection of liquid dung, colored with blood, and a urine equally bloody. Sometimes, also, tumefactions poorly outlined appear in the upper parts of the limbs or on the body ; they are hot, somewhat painful, slightly fluctuating as the bloody tumors in the beginning.

In the last period the respiration becomes difficult and gasping ; the muzzle is dry ; the mouth cold ; the tongue is pendant ; the eyes half shut ; the mucous membranes have a violet tint ; grinding of the teeth is heard. The animal falls and dies, after an agony marked by excessive struggles, by muscular contractions and by the expulsion of sanguine and diarrheal matters.

Under this acute form the fever habitually runs its course in ten to twenty-four hours.

(*b*) A still more rapid evolution may be observed. An animal in perfect health ceases all at once to eat or ruminate ; it is taken with violent muscular tremors ; respiration becomes dyspneic, irregular; the mucous membranes are cyanosed; the temperature leaps to 41.5°–42°C ; the beating of the heart is violent and the pulse imperceptible. The countenance betokens a profound agony ; one hears plaintive and repeated bellowing ; all movement is impossible. Soon the sick animal sinks, struggles and dies rapidly.

It may happen that the animal is suddenly stricken, while at rest and while ruminating ; in certain cases the evolution is so rapid that the subject is unable to rise ; he regards his flanks, rends the air with bellowing and dies in a few moments.

Death, in this hyperacute form, sometimes arrives in a half hour ; ordinarily it requires several hours.

(*c*) Finally charbon evolves itself sometimes much more slowly, under the subacute form.

The onset is marked, as in the horse, by vague symptoms, differently arranged. One observes a diminution of the appetite, derangement in rumination, mild and short colics, diarrhæa, weakness and a prolonged decubitus. At certain moments, the respiration is quickened ; the temperature undergoes extensive variations. With cows the secretion of milk is generally suspended.

To these manifestations, without any exact significance, is very often joined a very important symptom ; as in the horse, a sudden lameness appears and of a varying intensity.

After one or two days the signs of the beginning are accentuated ; the appetite is almost completely suppressed, but the thirst persists ; the coat is stary ; the mucus membranes are injected ; muscular tremors are observed ; diarrhea is permanent ; sometimes tumefactions, poorly outlined, show themselves at different points. The temperature undergoes extensive oscillations ; it reaches at certain moments 41.5°–42°, to descend soon again within the neighborhood of normal.

In the last stage, the ordinary symptoms of the disease finally appear, evolving under the habitual acute type, and in less than twenty-four hours the sick ones succumb.

The evolution is complete in two to five days. One must admit that a cure is possible in certain forms, as when only the manifestations of the first period are observed.

B. *External charbon.*—Bacteridien charbon with tumors, rarely observed in Western Europe, follows an inoculation through an abrasion in the skin (anthrax charbonneux). The tumors occupy, by preference, the region of the throat, under the belly, the forearm, the neck. . . . They begin by a small, soft swelling, which grows rapidly and acquires a considerable volume. The tumor is hot, painful, slightly edematous ; an incision allows a small quantity of highly-stained serum to escape ; on cutting one notes the presence of fibrinous clots, forming a yellow jelly, swimming in the midst of the distended tissues, and infiltrated by the blood which has escaped.

The general symptoms begin a little after the appearance of the tumors ; they are identical with acute and subacute forms already described. The cure can be obtained by proper

treatment; in this case the signs of general infection are scarcely perceptible, and all the troubles disappear in about eight to twelve days.

Lesions.

The lesions are almost identical in the different species, and it is possible to give one description which will cover them all.

Putrefaction of the cadavers operates rapidly; shortly after death the abdomen is distended; blood flows from the natural orifices; after several hours gaseous vesicles form on the surface of the viscera and in the muscular interstices.

The subcutaneous vessels being distended, allow the escape of a black and incoagulable blood; the connective tissue, infiltrated with a yellow serum, presents at diverse points hemorrhagic centres. The muscles are congested and ecchymosed; their tissue is friable and cooked; their tint often pale and yellowish, becomes salmon color some time after death. The inter-muscular connective tissue is often the seat of a fibrinous exudate stained by the blood. The ganglions are voluminous, softened, infiltrated and friable; on section they show vascular points of a uniformly deep color; the connective tissue which surrounds them is infiltrated and ecchymosed. The abdominal cavity contains a pink serum varying in quantity. The mesenteric vessels and the omentum are black and engorged with blood; those of the peritoneum are equally distended; there exist numerous subserous ecchymoses on the surface of the intestines and other organs. The wall of the stomach, principally in the vicinity of the abomasum in ruminants, and the cardiac extremity in solipeds, shows itself thickened by a serous exudate; the mucus membranes are congested and hemorrhagic. The intestines are the seat of decided lesions; the walls are thickened by interstitial hemorrhagic centres, isolated and punctiform, or confluent and united in spots; the mucous membranes are covered with a deep red, disseminated or duffused over an entire region; the villosities are hypertrophied and swollen. These lesions occur principally on the small guts, whereas they may be localized to certain flexures of the bowels only; on the other hand, they affect two-thirds or the entire length of the canal. The liver is congested, friable and cooked; it often assumes the yellow tint of a dried leaf.

The spleen is generally hypertrophied; it attains four to eight times its normal volume in the sheep, four to ten times in the

horse and ox. The organ is fossilated, softened, friable and gorged with blood; the parenchyma is reduced to a muddy pulp (bone splénique) of a deep dye. In some cases only the spleen remains almost normal. The kidneys are congested and ecchymosed; the urine contained in the pelvis of the kidney and in the bladder is nearly always stained with blood.

The abdominal lymphatic system is profoundly altered. The lymphatic vessels which course the intestine are voluminous, filled ordinarily with a rosy liquid; the mesenteric glands tumefied, congested, hemorrhagic, are floating in an abundant peripheral infiltration; sometimes the sublumbar glands are increased tenfold in volume.

[To be continued.]

"FOR A HORS."

A Western veterinarian sent the following to be filled :

Send this by this Boy
Tinker of Asfetty 1 ounc
—Camphor 1 ounc
Cappicom 1— —
Lodman 1— —
Mix

Anknite 10c
Cloraform 1 ounc

do not think this is spelt wright
but you will know what it is
it is for a hors. dock —— M. D.

Louisville *Medical News.*

CUBITAL NEURECTOMY.

Almy made resection of the cubital nerve in two cases of ringbone and inflammation of the carpal sheath in which median neurectomy did not remove the lameness.

The place of selection is the posterior border of the forearm, where the finger can feel the muscular interspace between the external and middle flexors of the forearm.

In both cases the lameness was diminished or even disappeared immediately after the operation. The author only recommends the operation as a last resort.—*Bull. Soc. Cent. de Méd. Vét.*

ABSTRACTS.

TWO SPLEENS IN A DOG.

A running-dog, age eleven years, very energetic, died from rabies, and at the autopsy showed two spleens. They were suspended by the great omentum and bordered the left sac of the stomach. They were separate and distinct from each other and falciform in shape. The one was normal in size and the other about one-third as large.—*Revue Vét.*

ANTHRAX CONVEYED BY OATS.

In December eleven horses, kept in two separate stables of the same proprietor, died from anthrax. The oats, imported from Russia, was suspected as the cause. Professor McFadyean made a bacteriological examination of samples of the oats obtained from the dealers. The grains were washed with sterilized water and the residue inoculated into animals, which succumbed to anthrax.

POISONING BY VETCHES.

Ostermann calls attention to three cows poisoned by green vetches blotched with numerous mildew spots. The principal symptoms were salivation, paralysis of the tongue, muscles of mastication, pharynx and esophagus. In one of the cows killed three days afterwards for consumption, nothing was found at the autopsy excepting spots of congestion on the esophageal mucous membrane. The other two cows recovered fourteen days after the suppression of the forage.—*Berl. Wochenschrift.*

RESTRICTIONS ON CATTLE TRANSPORTED INTO FRANCE.

All animals of the bovine species imported into France, other than those that are to be slaughtered in public abattoirs, are subjected to the tuberculin test and detained on the frontier

at the expense of the importer for at least forty-eight hours. Those that show a characteristic reaction are reshipped or, with the consent of the owner, at once destroyed by the veterinary inspector attached to the customs bureau.

HYPODERMATIC INJECTIONS OF VERATRIN IN MAMMITIS.

Detcheners calls attention to the good results of veratrin in mammitis in cows. In seven or eight cases which he has treated, the fever, passing above 40° C., was reduced in less than forty-eight hours ; the tension and engorgement of the udder gradually decreased and disappeared at the end of two or three days, without leaving any alteration in the milk secreted.

He recommends the following solution : veratrin, gr. vi ; alcohol, few drops ; distilled water, 2½ drams. Renew the injection if the congestion again manifests itself.—*Revue Vét.*

RESEARCHES WITH AVENIN.

Avenin, which Mr. Sanson is said to have discovered in oats and to which the latter owes its stimulating properties, has been the subject of investigations by chemists with indifferent results.

Wrompelmeyer and Schulze have not been able to find this principle. The last chemist, in analyzing the various vegetable substances used for food, has not been able to find any trace of avenin in twenty samples of oats. Instead of this principle, he has found *cholin*, which also exists in peas and vetches, and *trigonellin*, until the present only found in fenugreek.

He calls attention to certain products on the market under the name avenin and to which are ascribed special properties. —*Journ. de Méd. Vét. et de Zootech.*

A NEW SURGICAL DRESSING.

Doctor Kane, in the *Atlantic Medical Weekly*, suggests the use of asbestos wool as a new surgical dressing ; he claims "it is soft, non-irritating, possessed of absorbent qualities superior to cotton, and has the great advantage of sterilization without elaborate apparatus." Doctor Kane carries this wool in his

surgical case, and sterilizes at the time of operation by throwing into a fire and allowing it to attain a cherry color by the heat of the coals. He, moreover, employs the same dressing repeatedly, by using this same method of sterilization; and if all is true that he claims for asbestos, it certainly should supersede every other form of surgical dressing.

ACTINOMYCOSIS IN THE STOMACH.

Liénaux and Hamon observed three antinomycotic tumors in the rumen opposite to the superior part of the flank and a fourth one in the reticulum. They were soft, polypoid, reddish, areolated on section, and showed numerous small granules which were the colonies of the actinomyces. The body of the tumor had the structure of a fibro-sarcoma.

Two of these tumors are attached by a dense, fibrous cord to fistulous wounds of the left flank, which, during a year, had repeatedly formed around a puncture of the rumen performed by the owner. The authors believe that the abscess, fistulæ and tumors resulted from infection from the contents of the rumen in consequence of the puncture.—*Annales de Bruxelles.*

THE NUMBER OF HORSES IN DIFFERENT COUNTRIES.

	Per 100 Population.
Russia (1888)	22.9
United States (1894)	25.9
Germany (1892)	7.8
France (1892)	7.4
England (1893)	5.5
Hungary (1884)	12.1
Austria (1890)	6.5
Denmark (1888)	17.2
Belgium (1880)	4.9

For some other countries the following figures: Italy, 657,544; Holland, 271,900; Sweden, 489,045; Norway, 150,873; Switzerland, 98,622; Roumania, 594,962; Japan, 1,546,000; Argentine Republic, 2,213,000; Australia, 1,785,000; Algeria, 204,000; English Indies, 963,000.

The countries having the largest number of horses in proportion to the population are the United States, Russia, Denmark and Hungary.—*Pferdefreund.*

COLLEGE COMMENCEMENTS.

KANSAS CITY VETERINARY COLLEGE.

The fifth annual commencement of the college was held in the Masonic building, March 19. Professor Isadore Wolf delivered the valedictory address and Professor Wattles conferred the degree Doctor of Veterinary Surgery upon nine graduates.

INDIANA VETERINARY COLLEGE.

The annual commencement took place on March 13, at the College, Indianapolis. The class was addressed by T. L. Armstrong, President, and W. S. Tomlin, M. D. Diplomas were granted to five graduates: F. A. Muller, H. E. Smock, Indianapolis; Charles Regar, Silver Lake, Ind.; W. R Ramsey and F. Osborn. The first prize, consisting of a case of surgery instruments, was awarded to Chas. Regar; his subjects covered were surgery, lameness and shoeing.

NEW YORK COLLEGE OF VETERINARY SURGEONS.

The annual commencement of the New York College of Veterinary Surgeons was held at the college lecture room, April 1. The gold medal and the practical prize were awarded to Major Schofield; the silver medal to James H. Richardson. After the exercises, the faculty and graduates enjoyed an elaborate banquet at the Hotel Marlborough. Numerous toasts by the faculty enlivened the occasion.

The following is the list of graduates: Louis Abel, Brooklyn, N. Y.; Joseph Cohen, New York; John Hambleton Dedrick, Schenectady, N. Y.; George Clark De Witt, Oak Hill, N. Y.; James Thomas Glennon, Newark, N. J.; William Patrick Hanifin, New York; George Ferdinand Hörpel, Jersey City, N. J.; Milton Daniel Harper, Philadelphia, Pa.; John Francis Harrison, Stamford, Conn.; George Edgar Harder, Pittsfield, Mass.; Augustus F. Johnson, New York; Samuel Henry Johnson, Philadelphia, Pa.; J. Homer Luff, Paterson, N. J.; Eckford S. C. Littlefield, Brooklyn, N. Y.; James Francis Laden, New Haven, Conn.; J. Brown MacNeil, Albany, N. Y.; Charles Emerson May, Avon, Mass.; Daniel Gerald O'Connell, Brooklyn, N. Y.; Nathan Peyser, New York; Thomas Michael Quinn, Astoria, L. I.; William Riley Rhinehart, Inwood, L. I.; Robert Guernsey Rice, Rome, Pa.; Joseph Schnurmacher, New York; Charles Rinear Scattergood, Brooklyn, N. Y.; Major Schofield, Brooklyn, N. Y.; John Tjaden, New York; Charles Robert Utz, Freeport, L. I.; Max Wendel, Middle Village, L. I.; Walter Herbert Yingst, Harrisburg, Pa.

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JOHN GUITÉRAS, M.D., Professor of General Pathology and Morbid Anatomy.

JOHN MARSHALL, M.D., NAT.SC.D., DEAN OF THE FACULTY, Assistant Professor of Chemistry.

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JOHN W. ADAMS, A. B., V. M. D., Assistant Professor of Veterinary Surgery and Obstetrics.

W. S. CARTER, M. D., Assistant Professor of Comparative Physiology.

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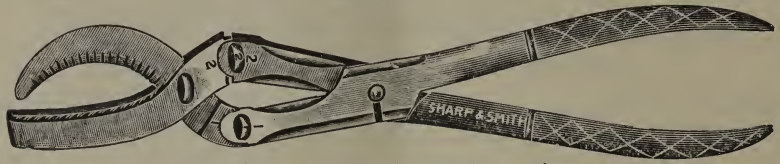

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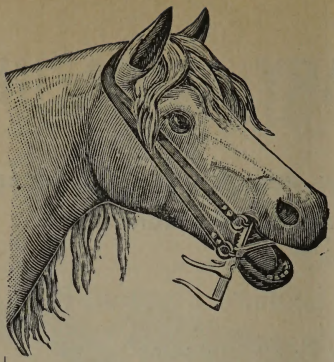

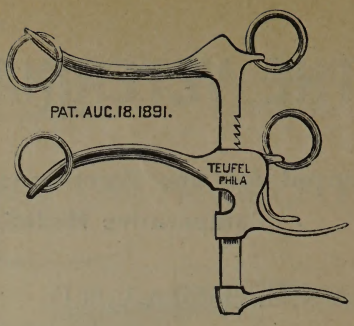

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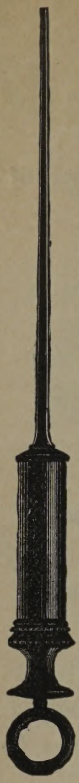

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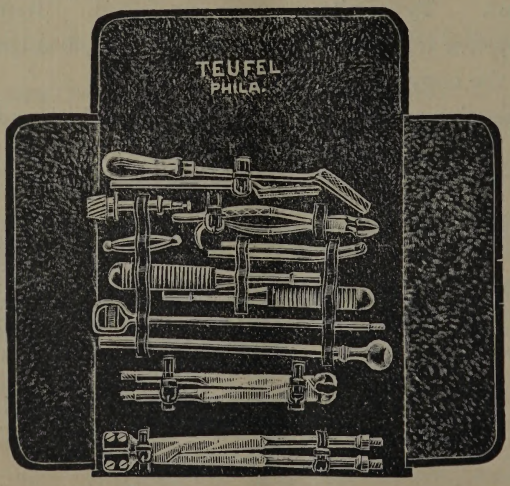

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